EDISON ELECTRIC INSTITUTE BULLETIN

VOLUME 13

FEBRUARY, 1942

Edison's Birthday Is Observed Nationally 41

General Power Conference EEI Tuned to the War Program 42

A Design for Building Good Will . . . . . JAMES E. DAVIDSON 43

Cable Loading for War Industry Loads . . . . . E. W. OESTERREICH 45

Conservation of Critical Materials Used on Overhead Lines . . H. J. HENDERSON 48

Matching the Load and the System Capacity . . . . . W. J. LYMAN 49

Effects of Pole End Bonding in Lightning Arrester Protected Cable Installations . . . . . N. B. WALSH 53

The Preservative Treatment of Wood with Pentachlorphenol . . DALE CHAPMAN 57

Conserving Man Power by Effective Health Education . . . . . JOHN J. BRANDABUR, M.D. 59

Conference on Reclamation and Scrap Salvage Held at Philadelphia 62

Eighteen Receive Edison Electric Institute Medals . . . . . MAE B. WOODS 63

Electrical Equipment Committee Meeting . . . . . R. W. WILBRAHAM 70

Transmission and Distribution Committee Meeting . . . . . E. V. SAYLES 71

Prime Movers Committee Meeting . . . . . J. A. KEETH 72

Personals 73

EEI Publications and Promotional Material 74

Home Service Today 75

Conventions and Meetings, 76

EDISON ELECTRIC INSTITUTE

THE ELECTRIC LIGHT AND POWER INDUSTRY

Current Statistical Data Covering 100 Per Cent of Industry

November, 1941

SOURCE AND DISPOSAL OF ENERGY—MONTH OF NOVEMBER

	1941	1940	%
GENERATION* (Net)			
By Fuel Burning Plants	10,395,271,000	8,730,618,000	+19.1
By Water Power Plants	4,085,777,000	4,033,890,000	+ 1.3
Total Generation	**14,481,048,000**	**12,764,508,000**	**+13.4**
Add—Net Imports Over International Boundaries	81,833,000	75,732,000	+ 8.1
Less—Company Use	268,542,000	146,013,000	+83.9
Less—Energy Used by Producer	320,107,000	480,684,000	−33.4
Net Energy for Distribution	**13,974,232,000**	**12,213,543,000**	**+14.4**
Losses and Unaccounted For	1,685,968,000	1,636,900,000	+ 3.0
Sales to Ultimate Customers	**12,288,264,000**	**10,576,643,000**	**+16.2**

CLASSIFICATION OF SALES

NUMBER OF CUSTOMERS—As of November 30th			
Residential or Domestic	25,955,582	24,907,175	+ 4.2
Rural (Distinct Rural Rates)	984,328	683,515	.....
Commercial or Industrial:			
Small Light and Power	4,295,223	4,252,548	+ 0.8
Large Light and Power	174,183	180,567	
Other Customers	121,541	114,689	.....
Total Ultimate Customers	**31,530,857**	**30,138,494**	**+ 4.6**
KILOWATTHOUR SALES—During Month of November			
Residential or Domestic	2,266,037,000	2,093,071,000	+ 8.3
Rural (Distinct Rural Rates)	169,892,000	131,322,000	+29.4
Commercial or Industrial:			
Small Light and Power	2,163,485,000	1,969,874,000	+ 9.8
Large Light and Power	6,652,829,000	5,379,431,000	+23.7
Street and Highway Lighting	205,874,000	201,203,000	+ 2.3
Other Public Authorities	281,375,000	236,769,000	+18.8
Railways and Railroads:			
Street and Interurban Railways	327,422,000	338,487,000	− 3.3
Electrified Steam Railroads	175,237,000	165,582,000	+ 5.8
Interdepartmental	46,815,000	60,904,000	−23.1
Total to Ultimate Customers	**12,288,966,000**	**10,576,643,000**	**+16.2**
Revenue from Ultimate Customers	**$233,962,800**	**$214,160,800**	**+ 9.2**

RESIDENTIAL OR DOMESTIC SERVICE (Revised Series)

AVERAGE CUSTOMER DATA—For the 12 Months Ended November 30th			
Kilowatthours per Customer	983	945	+ 4.0
Average Annual Bill	$36.76	$36.48	+ 0.8
Revenue per Kilowatthour	3.74¢	3.86¢	− 3.1

* By Courtesy of the Federal Power Commission.

Vol. 10, No. 2, EDISON ELECTRIC INSTITUTE BULLETIN: published monthly. Entered as second-class matter Aug. 17, 1933, at the post office at Philadelphia, Pa., under the act of March 3, 1879. Publication office, 56th and Chestnut Sts., Philadelphia, Pa. Editorial office, 420 Lexington Ave., New York, N. Y. Subscription rate $2.00 per year in the United States; $3.00 per year in foreign countries.

The Edison Electric Institute does not assume responsibility for, nor necessarily endorse or approve, statements made by contributors to the BULLETIN.

EDISON ELECTRIC INSTITUTE BULLETIN

Volume 10 FEBRUARY, 1942 No. 2

Edison's Birthday is Observed Nationally

Inventor's Son Reveals Edison's Plan to Keep Country Safe from Predatory Nations

FEBRUARY 11, 1942, the ninety-fifth anniversary of Edison's birth, designated as Thomas Alva Edison Day in a proclamation by the President, was appropriately observed in many places throughout the country. Congress adopted a resolution last summer authorizing and requesting the President to commemorate the day by "calling upon officials of the government to display the flag of the United States on all government buildings on said date and inviting the people of the United States to observe the day in schools and churches, or other suitable places, with appropriate ceremonies." Even before his death in 1931, Mr. Edison's birthday had been celebrated for a number of years by the Edison Pioneers and by more or less formal observances of other groups, but this year marked its first recognition by presidential proclamation.

In New York City, the Edison Pioneers held their twenty-fifth annual luncheon in honor of Mr. Edison. Speakers at the luncheon were Governor Charles Edison of New Jersey, son of the inventor and Dr. Harvey N. Davis, president of Steven's Institute. Earlier in the morning a wreath had been placed at 25 Pearl Street, the site of Mr. Edison's first commercial incandescent lighting power station. At 12:30 p.m. members representing three generations of the Edison family took place in a broadcast over the National Broadcasting Company network from the New York Museum of Science and Industry, 1260 Sixth Avenue, where a special collection of Edisonia has been assembled.

The exhibition was officially opened by Mrs. Edward E. Hughes, the inventor's widow. Her daughter, Mrs. John E. Sloane; her son, Governor Edison, and her grandson, Thomas Edison Sloane, also spoke on the broadcast. The exhibition includes models and duplicates of some of Mr. Edison's inventions.

After asserting that today "it is still necessary to start actual firing in earnest on the industrial front," Governor Edison told, at the Edison Pioneers luncheon, how his father looked to the future defense of the country by work such as research in production of artificial rubber. The Governor read a memorandum written by Mr. Edison during the last war, summarizing what he felt would be "a proper program for our country to follow during the reconstruction period after the war."

The memorandum said the country should prepare itself against any possible invasion. It specified that the country should "organize for national defense a general staff of the best military officers in connection with a civilian staff of our best engineers, together with a staff composed of men of great executive ability who organize and direct our great business affairs and who can hustle and get things done quickly." It added that the nation should "adopt the methods so laboriously worked out by the Germans for tabulation and coordination of all the factors."

Declaring that a large permanent Army was not necessary, the memorandum asserted that what was needed was "plenty of officers and drill sergeants," with at least two military academies in addition to West Point and schools for instruction of drill sergeants, artillery men, submarine operators and signal men.

"We should have the brain of a great army ready on the drop of a hat, but no professional soldiers much above what we now have," it continued. "Thus we should have probably the best led Army in the world with very little annual expense."

Mr. Edison called for a large Navy "of extremely rapid ships of the highest power," an excessive number of high speed mine-laying boats and mines and several hundred submarines, most of them stored on land. He advocated training of their crews and returning them to private life as reserves, with the same procedure for airplanes and signaling apparatus.

The memorandum urged also the most powerful armaments for harbor defenses, decentralized munitions plants with a capacity twice that imagined to be necessary and "an enormous stock of raw materials."

He further advocated more artillery per capita than any other nation, greatly extended wireless systems with trained reserves, a system of military roads along the seaboard and a law permitting the government to commandeer any necessary article.

"In other words," Mr. Edison wrote, "I would have the United States permanently on a war footing only against invasion and only so far as machinery, supplies and officers are concerned."

In this way, he added, the country would avoid being a military nation but predatory nations would take warning.

"It is time," he concluded, "that democracy should become efficient like the autocracies, and the present is the most propitious time to try the experiment."

Governor Edison also discussed his

father's activities, during the last war, which included the construction of plants for the manufacture of carbolic acid and paraphenylenediamine, and the investigation of nearly 50 subjects for the Navy, including the detection of submarines by sound from moving vessels, locating positions of guns by sound-ranging and obstructing torpedoes with nets.

Dr. Davis said that Steven's Institute will take over the care of the Edison Tower at Menlo Park, N. J., erected as a memorial to Mr. Edison. His announcement followed the reading of a letter from William S. Barstow, honorary president of the Edison Pioneers, who said war conditions had made it advisable to dissolve the Thomas Alva Edison Foundation, which owned and maintained the tower. Mr. Barstow, who not only contributed funds for the tower but also a museum and a gatehouse near the tower, said he has arranged for the creation of a trust, the income of which will be paid to the Institute for the care, maintenance and operation of the tower, gatehouse and grounds.

Mrs. Hughes gave a silver loving cup to the Edison Pioneers on the occasion of the organization's silver anniversary, saying that "we wanted to do something as a family for the beautiful things the Edison Pioneers have done for us." Speaking earlier on the N.B.C. broadcast, she expressed her gratitude and happiness at the recognition of Mr. Edison's honest, selfless, untiring labors of love for his fellow men.

General Power Conference E.E.I. Tuned to the War Program

Meetings March 24th-26th

Edgewater Beach Hotel, Chicago, Ill.

ELECTRICITY is an acknowledged key to defense, and commercial men of the utility industry who have been responsible for the promotion of its use in peacetime have numerous problems to solve in their effort to find ways and means of applying the trained personnel of the utilities, their facilities and technical skill in promoting the major objective of winning the war.

There are unpredictable circumstances that influence commercial activities, and an exchange of ideas on how the commercial forces of the entire electrical industry can best tune-in to the war emergency becomes more important than ever. A national Conference for this purpose has been scheduled for Chicago, March 24-26. It was decided by the Institute that the contributions of such a meeting to advance the war applications of electric service supply would more than justify the time out for attendance.

Electricity reaches into every phase of production of war materials, and into the living of all persons engaged in the war effort. Experience in England has proved beyond doubt that "electrical" living contributes effectively to the morale of the home front.

It is of more than passing interest that in the February issue of *World Convention Dates*, one reads the following: "Of 2688 conventions scheduled for the first two months of this year, only 55 were cancelled by the war. On the other hand, 83 more conventions were scheduled for these two months than for the same period of 1941." This appears to be the time for a meeting of authoritative minds in all business in order to crystalize action for the best interests of the needs of our nation. It is a particularly appropriate time for the electrical groups to convene.

Agricultural and industrial problems are outstanding in the list for attention, and in addition we have those of home and commerce. At the Chicago Conference there will be no sectional group meetings this year, but all-day sessions on March 24 and 25, and the morning of March 26. A luncheon session will close the Conference.

Prominent speakers, from within and without the electrical industry, including government representatives, will speak authoritatively on the subjects selected. Commercial executives of utility companies from coast to coast will find absence of time from the office well spent, and will obtain the latest information on subjects which are daily gaining their attention. They should make their plans now to be present and to bring the pivotal men of their organization.

Manufacturers' representatives and others interested in electric service supply are cordially invited to attend the sessions, all of which will be "open." It is suggested that reservations be made in advance at Edgewater Beach Hotel, where special rates are in order.

Among the subjects to be discussed on the program are the following:

"We're in the Army Now."

"Holding Customer Goodwill Under Emergency Restrictions."

"Converting Civilian Production to War Production."

"Blackouts."

"Symposium on Residential Service."

"Home Service Can Help Contribute to the Family Health."

"New Approaches in Advertising."

"Assisting the Customer to Make Maximum, Effective Use of His Existing Electrical Facilities."

"Lighting as a Tool to Help Win the War."

"How We Made Rationing Effective in Our Company."

"What Utilization Equipment Will Be Available?"

"U. S. A.—The Bread Basket of the World."

"The Immediate Future and Beyond."

"What to Expect on Rationing?"

A Design for Building Good Will

By James E. Davidson
President, Nebraska Power Company, Omaha

Courtesy, Executives Service Bulletin, Metropolitan Life Insurance Company

A CORPORATION, according to English and American common and statute law, is "a body politic or corporate, formed and authorized by law to act as a single person."

Within that brief definition lies the whole problem of public relations—how to induce each individual belonging to this "corporate person" to deal with the public in such a manner as to win its respect, friendship, and approbation. For, even as individual success depends largely upon public good will, so does the success of any business corporation.

In the Nebraska Power Company we have sought this public good will assiduously and have had many manifestations of its active existence. Our company has always been operated on the principle that its success would be measured by the increase in the confidence and good will of its customers and the public. As an evidence of the effect of this policy, I cite a recent statement signed by the Mayor or town-board head of every rural-community served by the company.

> We believe the Nebraska Power Company has done more to put our electric service on a proper basis than any organization that has ever served us. We have lower electric rates than ever before, and are well pleased with the service they give us. Our relations with them are pleasant, and they are considered a real local citizen in our respective communities. We hope we will continue to be served by the Nebraska Power Company for many years to come.

Reflecting the sentiment in Omaha, the largest city served by the company, a newspaper editorial summed up the policies of our company in this statement:

> Omaha folks learned quite some little time ago that the Nebraska Power Company is more concerned in serving its customers well than in squabbles over rights, franchises, and the like. What seemed like a calamity when it was discovered that the company had a perpetual franchise in Omaha has turned into a blessing.

Let me describe briefly the area served by our company. It is 2500 square miles in eastern Nebraska and 500 square miles in western Iowa. The total estimated population within the area is 351,000, of which 223,000 are in Omaha and 43,000 in the neighboring Iowa city of Council Bluffs. Ninety-one thousand customers are served by our organization of 850 men and women, more than half of whom have been with the company for 10 years or longer. The average length of service is about 15 years. For the executive personnel, the average period with the company is nearly a quarter of a century.

According to our observation, the industries of our country at last are aware that the public likes to transact business with companies whose commodities and services are superior, and whose executives and employees are friendly.

This has been illustrated often in the electric utilities field. Opinion surveys have found that in communites where power companies had poor public relations, customers were prone to consider rates high even though they actually were very low. In other cities, where good public relations but higher rates existed, customers praised the company and frequently referred to their cheap electricity.

Each company's problem in that all-inclusive field of good public relations calls for individual study, planning, and effort by every person who is a part of this "corporate person." All the officers and all the employees should "act as a single person," and should interpret the company's public relations policies with a crusading spirit that can come only from sincere convictions, proper training, and accurate knowledge.

Regardless of what prescription you use, you must win and hold the confidence of your customers. If they dislike your company, their dislike is active, not passive. They will seize every opportunity to criticize you, your products, or your service. They can destroy more public good will in a day than you can build in months.

In the Nebraska Power Company we have built our *public* relations program over a period of years with full cognizance of the prerequisite of building and maintaining good *employee* relations.

In all our offices, in the rooms of our service headquarters, and in our power stations hangs a framed pledge:

> OUR AIM: To serve our customers well and at the lowest rates commensurate with the high standard of service; to conduct our business with courtesy, efficiency, and dispatch; to treat our customers fairly and without discrimination; to deal frankly and openly with the public at all times.

That pledge is not just an idle statement of wishful thinking. We mean every word of it. Throughout our organization it has come to be looked upon and respected as the "law" governing relations with the public.

How do we make it work?

Build Esprit de Corps

First of all, we have sought, and with gratifying success, to build an *esprit de corps* throughout our organization by instilling in the minds and hearts of all employees the idea that, in their dealings with customers, they are indeed "the company." What they do and say reflects credit or discredit, confidence or distrust, good or ill will, on themselves and also on the company.

Prerequisites to attaining employee cooperation and loyalty are: first, careful selection of employee personnel and, second, proper training for this personnel. Proficiency in performing the routine tasks to which men and women of the company are assigned is to be assumed. Employees must also show interest in the company, interest that transcends mere efficient accomplishment of such routine tasks.

Every applicant for a job with our company is given a courteous, personal interview which lasts from 10 minutes to a half hour. If it is impossible to hire an applicant, he or she receives a letter from a company official expressing regret at being unable to employ the applicant at the moment and thanking him for his application. We feel gratified when a person wants to work for us, and believe the least we can do, if we are unable to employ him, is to thank him for that implied tribute.

As to those we do employ, prospective members of the Nebraska Power family are checked carefully on character, education, experience, adaptability, family background, and credit standing. This inquiry is made by personal investigation

or contact. After an employee is placed on the pay roll he is interviewed again by a representative of the personnel department, who gives him literature about the company, its history, its background, and its policies. We believe he wants to know all about us, just as we have made it our business to know all about him. Special training for special tasks is a continuous activity.

We realize that the attitude of each employee contributes to the personality of this corporate body, our company, and we place special emphasis on courtesy and other qualities which will make this personality pleasant.

Promotion on Merit

It has long been our company's policy to seek career men, not mere jobholders, and to promote from within our organization on a merit basis as rapidly as employees show qualifications for greater responsibilities and as opportunities for such promotions occur. Our treasurer, for example, began as an office boy with the company; the assistant treasurer, as a clerk; our purchasing agent, as a power station employee; and many department heads have risen from clerks, linemen, messengers, and other positions. They are examples that the company offers opportunity for advancement in reward for faithful, efficient service.

Stressing the importance of every position, from office boy up, we give special attention to our employees' service records. In recognition of the service they have given and the experience they have acquired, employees receive service award pins at the completion of each five years.

The company's friendly interest in their welfare is further shown by its support of employees' social, recreational, and welfare group activities; their baseball teams, golf and bowling leagues, credit union, and sick benefit association; and an insurance plan. The company participates in financing night school and correspondence school courses, and also carries on a consistent accident-prevention campaign.

This attitude on the part of the company makes employees regard their training as public relations emissaries with keen personal interest and eagerness. There is an awareness that whatever they do to promote the best interests of the company, they do also for themselves.

There are many ways to provide employees with accurate information about the company to be passed on to customers at every opportunity. In our company this is done both by personal contact and through the distribution of printed matter.

As a result of questions asked an official at an employees' meeting a few years ago, we organized a series of round-table meetings. At these meetings, department heads discussed and answered questions concerning the operations of their departments, and officers gave the employees a fund of general information about the company and its policies. Every employee was reached through a schedule of small group meetings over several weeks.

Company bulletin boards, and the distribution to employees of reprints of institutional advertisements and other company information, keep our people informed on current activities. Bulletin boards offer an excellent approach to the employee, but to be of value they must be properly located, carefully attended, and not profusely covered with extraneous material. Our company has some 60 such boards, strategically placed. Only pertinent matter is posted, and the material is kept fresh by a stamped notice on each piece which reads, "Remove this bulletin on—(date)—," the date usually being about three days after posting.

Annual Report to Employees

At the year's end, each employee receives an annual report similar to that furnished to stockholders. This gives the same essential facts that are contained in the formal annual report, presented, however, more from the viewpoint of the employee. It is devoid of much of the financial wording that one usually finds in such a report.

This, then, is the prescription for the most effective public relations "department" a company can have: Its officers, employees, and stockholders must unitedly strive to keep the public informed about it and the service it renders. But, implementing this "department," there must be concrete action and evidence to support the company's claim for a place in the sun of public approval.

Let me, therefore, briefly outline a few ways in which I believe any company can win and hold public good will:

The company should seek and fulfill civic responsibilities to the end that it is recognized as a "fellow citizen" doing its full share, or more, for community welfare and development. Again referring to my own company, it is our belief that the company has an obligation of citizenship in every community that it serves—and we have conducted our business on that basis. We feel that each employee should likewise recognize his responsibility to his community and take an active part in community affairs. To that end, officers and employees of the company have participated in every activity of a civic or community nature, both financially and through good old-fashioned hard work.

Be courageous and aggressive, yet tolerant. Industry has a good story to tell. Tell it well, but give to the opinions of others the consideration that you, too, desire.

Know what customers think about your company and why they think as they do. Find out what they like, and do more of it; find out what they don't like, and do less of it.

Keep up with the times in your personal and form letters. They should never be coldly impersonal and stereotyped. Let them breathe a genuine interest in the customer.

In all you say and do, show genuine interest in the customer. This should not be a sporadic activity, but one maintained year in, year out. There are many ways to do it, any of which demand long hours of planning and work, but if done wisely and well, the recompense is great.

Don't fall short in telling all your customers all they should know about your company. You cannot tell where the fallow ground may lie in sowing the seeds of public understanding and good will. The part you leave untilled may nourish the tares and thistles of ill will and unfavorable criticism.

Col. Kelly Honored by A.S.C.E.

CITING him as "one of the notable engineers of the United States" the American Society of Civil Engineers at its annual meeting in New York City last month, conferred an honorary membership on Colonel William Kelly, President of Buffalo, Niagara and Eastern Power Corp.

Such honorary memberships in the A.S.C.E. have been awarded to only 28 persons in the United States and are limited to those "of acknowledged eminence in engineering."

The Society in bestowing the membership, saluted Colonel Kelly for his "brilliant record in engineering, high personal character, soundness of judgment and great moral courage." This award adds another to a long list of honors conferred upon Colonel Kelly in this country and abroad.

Coming to Buffalo, Niagara and Eastern Power Corp. in 1926 as Vice-President in charge of engineering, Colonel Kelly was appointed three years later to the position of Vice-President and General Manager of the Corporation. In September, 1933, he was elected President.

Cable Loading for War Industry Loads

By E. W. Oesterreich
Duquesne Light Co.

Progress report presented at EEI Transmission and Distribution Committee meeting, Cleveland, Feb. 9, 1942

THE subject of cable loading as it pertains to war industry loads should be considered with two ideas in mind: to set the highest permissible rate for normal daily load cycles, and to supplement this rating with permissible rates for emergency operation during periods of short duration that might exist for any portion of a normal load cycle.

The conditions pertaining to normal daily load ratings have received considerable attention from the industry during the past years and have resulted in definite limits being established for average conditions from the standpoint of permissible copper temperatures that will insure a long life for the cable. It is believed that further investigation along these lines is warranted in order to determine what increase might be made in the present permissible daily load ratings with an accepted shortening of the normal life expectancy.

The problem of rating, as applied to emergency conditions, has been treated in far less published data than the problem of normal daily loads. With the present National Emergency, there is an urgent need for reliable ratings to be established soon, which will permit the maximum possible load on feeders for short periods. The need for these emergency ratings becomes even more apparent with the realization that normal daily load ratings are very dependent upon the short time emergency ratings for load centers supplied by two, three or four feeders.

The problem of establishing reliable load ratings for either normal daily load cycles or emergency conditions involves consideration of two major factors: cable movement which produces mechanical damage to the lead sheath, and copper temperatures which produce damage to the insulation. In the case of cable movement, it is more proper to say that this is dependent upon load changes rather than upon maximum load values.

In an attempt to arrive at a satisfactory solution to these factors, the Committee is presently engaged in research work along these lines, and the following discussion should be considered in the light of a Progress Report. Assumptions which are set forth on the basis of data so far available should await further substantiating test data before being considered as definite conclusions.

Cable Temperatures for Emergency Loadings of Lead-Covered, Impregnated, Paper-Insulated Cables

The maximum permissible current loading of a cable is the amount of current which will produce the maximum permissible copper temperature. In the case of any particular cable, the actual value of this current depends, among other things, upon its thermal capacity and the ability of the materials in the immediate vicinity to conduct heat away from itself.

For many years, the I.P.C.E.A. tables based upon the rule of 90°-E have been used as a guide in determining maximum permissible daily load ratings under average conditions. It is not the intention of this report to depreciate in any way the value of these tables as a guide for the operator whose policy it is to do little field survey work. It is suggested, however, that an operating policy which permits complete knowledge of and control over duct system characteristics will permit taking advantage of favorable field conditions and, in many cases, result in the increasing of permissible current loadings without exceeding the copper temperature limits of 90° C-E.

A review of available literature on the effect of temperature on impregnated paper cable insulation has been made, and some very interesting laboratory and field results were found reported there. One company reported operation of some of its 13-kv cables for a number of years at 100° C with no apparent damage to the insulation. Various tests have shown that the effect of temperatures up to 140° C on the insulation is one of a mechanical rather than an electrical nature, i.e., the tensile strength tended to decrease only slightly over long periods of heating, while the electrical characteristics remained practically constant, showing little change until the mechanical properties had been almost totally destroyed.

It seems, therefore, that the daily operating temperature of a cable should involve a consideration of the desired life of the cable with respect to its connected equipment. This is particularly true of cables serving war loads where saving of material and investment is important. The problem, then, is one of economics involving such factors as rate of load growth, replacement schedule due to obsolescence, system changes and improvements, tolerable failure rate, voltage regulation, cable movement, etc.

In the case of many cables, the daily loading limit is not actually set by the rule of 90°-E but by the emergency condition to which the cable may be subjected for short durations once or twice a year. Consider as an example the case of two feeders feeding a given load. If the emergency operating temperature is not to exceed the rated 90° C-E, then the two cables cannot be loaded above 50 per cent of their rating for daily use to allow for failure of one feeder. In the case of three feeders feeding a load, the daily load figure becomes 66 2/3 per cent.

From this it becomes apparent that in many cases it is not the daily loading which is a problem but rather the maximum permissible emergency operating temperature which determines the daily load rating.

The question of what temperature limits should be set for cables in emergency operation presents a different problem, however. Since an emergency is assumed as occurring only once or twice a year, and then for only a short time, there should be no problem of cable movement as affecting the sheath life. Rather, it is strictly a problem of conductor temperature and the resulting permissible damage to the impregnated paper insulation, with special concern for the undesirable cumulative heating possibility.

Apparently, little work has been done in an attempt to establish short-time emergency copper temperatures; at least, a rather thorough survey of published operating data did not reveal sufficient data to establish a reliable method of ar-

riving at dependable temperature limits.

It is known that the temperature rise of a cable, when subjected to a constant load, follows an exponential function with respect to time, reaching its maximum a few hours after the application of the load. There seems, however, to be some disagreement as to how long it takes to reach this maximum temperature, opinions ranging from 4 to 9 hr for different size cables. For purposes of arriving at an approximate answer, one operating company has assumed this time to be 6 hr, and the maximum temperature to be reached by the conductor under all emergencies was set at 110° C for 11-kv cables. Four-kv cables are allowed 120° C, while 22-kv type "H" and belted cables are allowed 105° C and 100° C, respectively. The reduction in permissible copper temperature for the higher-voltage cables is made in an effort to avoid the possibility at high temperatures of thermal instability due to heating produced by dielectric loss. These temperatures are in close agreement with those proposed by other companies, but for cables manufactured prior to 1924 it is recommended that these limits be reduced 15° C.

It becomes apparent that an emergency schedule is desired which will give the permissible loadings for emergencies of 15 min, 1-hr, 4-hr and 8-hr duration. The permissible temperatures would be reached only at the end of these periods, at which time switching could be performed or load dropped to prevent any additional rise in temperature. Under this proposed practice, the temperature limits as set forward are believed to contain a large factor of safety and are therefore highly conservative. If continuous heating at 120° C for long periods of time produces little or no mechanical damage to the impregnated paper insulation, as evidenced by recent investigation, then certainly arriving at 120° C at the end of 15 min or 1 hr or 4 hr of an emergency should be perfectly safe. Future studies and tests are being planned to substantiate these assumptions. Although it is strongly suspected that higher temperatures can be tolerated for shorter emergencies, without insulation damage, it is advisable due to lack of operating experience that present considerations assume the same maximum temperature for all emergencies.

A sample set of ratings has been determined for the hypothetical case of an 11-kv, 350 MCM impregnated, paper-insulated cable in a 6-duct bank of similar fully-loaded cables. The cable in emergency operation is assumed to start from the fully-loaded condition, or 100 per cent load. The trial ratings indicate that approximately 240 per cent normal rating may be carried for 15 min; 168 per cent for 1 hr and 148 per cent for 4 hr. For the 8-hr emergency the 4-hr rating is permitted for the first 4 hr and a slight reduction for the second 4 hr to maintain the temperature at 110° C. Although as yet no tests have been made, it is believed that cable joints and terminals are fully capable of withstanding these temperatures.

In arriving at an emergency rating, each circuit should be studied separately to locate the bottleneck or limiting factors to be considered in determining the rating. Thermal surveys, if necessary and feasible, should be made; but in cases where unknown or doubtful sources of heating may exist, a factor of .8 applied to the permissible temperature seems advisable and would result in a reduction of approximately 10 per cent of allowable current. Although cable in good condition should not be affected by emergency operation at these temperatures, it is possible that the ultimate failure of a dielectrically defective joint may be hastened by this operation. It must be borne in mind, however, that failure during an emergency is to be avoided at all costs; hence, until more reliable operating experience is accumulated, conservative copper temperatures should be adhered to.

With approximately 140 per cent normal rating as the new 8-hr emergency rating, the normal permissible load for one cable of a 2-feeder station can be 70 per cent of normal *rating*, or an increase in normal capacity of 40 per cent over the former 50 per cent limit. For the 3-feeder station, this normal loading increases from 66 per cent rating per feeder to 93 per cent per feeder. For the 4-feeder station, the increase is from 75 per cent to 100 per cent rating (actually 105 per cent if the I.P.C.E.A. rule be exceeded slightly). In all cases for 2, 3 or 4-feeder stations the normal feeder load which can be carried is increased 40 per cent. This, of course, means an increase in system capacity of 40 per cent.

In presenting this portion of the progress report, it is desired to again stress the fact that the proposals set forth herein are not to be taken as final, but should be considered as pointing the way to a solution of the problem of securing maximum use of existing equipment in serving war time loads. The values should not be used indiscriminately but, if used at all, only under the closest supervision and with a full knowledge of field conditions.

Cable Loading—Mechanical Movement Studies

During the past several years, it has been recognized that under many loading conditions mechanical damage to cable sheaths has been the factor determining the ultimate rating of the cable. It should be realized, however, that such mechanical damage is the result of the character of a fluctuating load rather than the maximum value of load carried. It is a fact that a cable carrying 100 per cent rated load continuously would present no mechanical problems unless influenced by thermal conditions outside itself.

If steps are to be taken to minimize mechanical damage due to increased war loads, it would seem that there are two lines of attack, as follows:

1. Improve load factors on lines carrying heavy block loads.
2. Determine what steps can be taken to minimize the amount of damage for any given amount of cable movement in manholes.

In the case of Item No. 1, careful studies of individual load conditions on the part of each operator should point the way to numerous possibilities.

Item No. 2 seemed to the Committee to present the greatest possibility of productive results for immediate use, and accordingly steps have been taken to approach the problem from a number of angles, as follows:

1. A review of all available literature on the subject of cable movement has been made.
2. As a result of this review, it was deemed desirable to set up a dummy manhole similar to that used by Halperin and described in his A.I.E.E. paper of October, 1939.

So far, a limited amount of tests have been conducted on a typical barrel-shaped manhole with 8 ft x 5 ft 4 in essential dimension, 3/c, 500 MCM, 15-kv cable having 8/64 in conductor and 10/64 in belt insulation, and ⅛ in lead was used on all tests.

The following is a summary of the results so far accomplished. It should be borne in mind that they are in no way conclusive, but in many cases probably do indicate trends. All tests thus far have been made with ¾ in. movement at the duct mouth. Cable joints were filled with oil under a slight pressure, and all failures were indicated by oil leaks. Lowering of the oil pressure caused the operation of a pressure-con-

trolled switch, thus shutting off the driving motor.

Initial Tests, Unfireproofed Cable, Otherwise Standard Construction

Curvature changes.

The curvature changed from the original shape to maximum that could be formed with the available cable in the manhole. The ends of this maximum curvature or arc tended to move into the joint and moved 3 in to 6 in within the duct mouth.

Cable diameter changes.

Folds developed in the cable sheath adjacent to the joint and duct edge. The development of the folds was noticeable after the start of each test. This development, in general, resulted in one large fold flanked by two smaller folds. Diameter measurements on the remaining portion of the cable sheath indicated no material change.

Nature of failure.

Test life averaged approximately 300 cycles. The failure occurred at the base of the larger fold nearest the joint on the outer side of the radius.

Cause of failure.

Necking of the sheath at the base of the larger fold due to tension. The maximum stress due to repeated bending or flexing of the sheath occurred at a spot in the curvature where the external and internal forces could not prevent a small radius section from forming in the cable.

Observations.

Hanger friction, small alignment variations and tendency of cable to lengthen out caused cable bending to become concentrated at one location. The concentration of the stress in this location caused the sheath to be separated or pulled apart. The portion of the cable pulled away from the necked area formed the major fold.

Mounting of the test specimen so as to restrain the joint and force the movement to take place in the bends resulted in increasing the life two to three times. The failure in this case was adjacent to a fold which was located midway between the joint and duct edge. In addition to the necking failure, the entire surface of the sheath was found to be covered with minute cracks indicating that the sheath had been worked or kneaded.

Mounting of the test specimen so as to swing free resulted in increasing the life 12 to 14 times. The failure in this case also occurred adjacent to the joint at the base of a fold and was due to necking.

Initial Tests, Concrete Fireproofed, Cable, Standard Construction

Curvature changes.

Very little observable change in curvature as compared to the original shape was noted. The fireproofing tended to cause the cable to hold its original shape. The ends of curvature did not tend to enter the duct. There was some tendency for the cable to snake within the duct.

Cable diameter changes.

Diameter measurements on the cable under the fireproofing indicated no material change. Folds developed in the sheath within the duct adjacent to the fireproofing.

Nature of failure.

The test life averaged approximately 11 times that of the original unfireproofed sample. The failure occurred adjacent to the joint where folds developed. The surface of the cable sheath adjacent to the area of failure indicated that the sheath had been restrained externally by the fireproofing and supported internally by the cable proper.

Cause of failure.

The working or kneading of the sheath apparently caused a crystallization or pulverizing of the lead at the point of failure. The restrained sheath was apparently periodically subjected to compression of such a nature as to cause "slip lines or areas." Considerable stress was also exerted at the folds in the cable within the duct mouth. These folds showed numerous surface cracks indicating the working or kneading of the sheath at this spot.

Observations.

Hanger friction, small alignment variations and stiffness of fireproofed cable tended to cause stress to become concentrated at certain areas. The damaging influence of this concentrated stress is materially retarded by the coat of fireproofing. The stiffer and stronger type of fireproofing appears to give the greatest amount of aid. Some specimens with asbestoment fireproofing appear to have a slightly shorter life.

The most apparent conclusion is that cable fireproofing applied to the cable provides a material aid in increasing the mechanical life of the sheath as affected by cable movement. This aid is in the nature of a restraining force which tends to restrain the cable sheath and prevent folds from forming at maximum stress points.

Hanger friction, small alignment variations and curvature shapes tend to aid the cable in assuming a curvature where there is a tendency for hinge action at some particular location.

The application of a thicker coating of fireproofing from duct edge to duct edge may tend to keep the cable from being unduly stressed at some point. Increasing the thickness of fireproofing at maximum stress points has been indicated as another aid.

Free movement of cable on hangers has indicated that sheath life may be prolonged as hanger friction is one source of aid in concentrating the stress.

Correct curvature of the cable in the manhole to give a minimum of concentrated stress and a maximum of free bending indicates that present design practices may be modified.

A study of these data which indicates a definite need to continue the tests, and the difficulty in obtaining adequate cable for tests, has given us sufficient reason for building a 1 to 6 ratio model of the present dummy manhole apparatus. This machine is practically complete, and tests are scheduled for the near future. We believe that valuable information in connection with cable curvature and hinging action may be obtained from the small machinery. In general, it is believed that while the tests conducted on the smaller machine will not be quantitative, they will be sufficiently qualitative to permit a relative comparison of the test results. The cable to be tested on this machine will bear the same 1 to 6 relation to the larger cable.

The conclusions which we have drawn from these tests may be considered as indicative of a trend in cable operation which will be followed up by additional test. The limited number of tests completed to date, of course, does not necessarily permit a complete acceptance of these conclusions. Practical application, likewise, is dependent on field conditions and the ability to place them in operation.

While it seems that relatively little progress has been made on this problem, it should be borne in mind that conditions brought about by the present emergency have made it extremely difficult to keep men continuously at work on this study. Not only has it been necessary to put the men on other assignments, but it has twice been the case that the man assigned to this particular study has been called for military duty.

The problem of cable for future tests seems to have been solved by the offer of one manufacturer to lend us test lengths after he has finished with them.

Conservation of Critical Materials Used on Overhead Lines

By H. J. Henderson
Ebasco Services Inc.

Paper presented at EEI Transmission & Distribution Committee Meeting, Cleveland, Feb. 10, 1942

ALL of us are well aware of the scarcity of critical materials such as aluminum, copper, nickel, rubber, steel, tin and zinc arising from the war. Also, we know we must be prepared for scarcity of some presently non-critical materials and equipment as the tempo of war activities is stepped up. Transmission and distribution engineers of electric utility companies have an unselfish interest in cooperating with the Bureau of Industrial Conservation of the War Production Board in conserving materials and equipment.

Substitute Materials

Many transmission engineers are familiar with the possible economies in the use of wood H-frame and double H-frame structures as compared with steel structures for transmission lines. An example of wood transmission structures developed due to difficulty in obtaining steel is that of an eight-mile double circuit 110 kv line built by a southern company this past summer, in which only four steel towers were used, two for a sharp angle and two for a high crossing. An unusual feature of the wood structures used in this line is that no holes are bored in either the poles or crossarms. Crossarms are attached to poles by means of clamps and timber connectors, and insulator strings are secured to crossarms with crossarm clamps. Instead of having two poles in parallel, they are canted so as to be closer together at the top of the structure. The three crossarms provide a sturdy structure, and are augmented by wood X-bracing at the extreme top. The X-bracing also serves as ground wire supports.

Companies not having a sufficient stock of steel tower material for replacement of damaged towers might consider maintaining a stock of extra length wood poles for replacing steel towers by H-frames or other types of wood structures in event of sabotage, or other types of damage. These extra length poles, when involving lengths of 70 ft or longer, must be stored so as to obviate the necessity of transportation difficulties on streets and highways. Also, because of their weight, transportation will be slow.

Another possibility is fabricated wood transmission towers constructed by the use of timber connectors such as metal rings, metal plates, wood disks and dowels. The development of these connectors began in Central Europe and Scandinavia during World War I due to metal shortages. It is claimed that these various connectors lend themselves ideally to the use of planks and boards in builtup members to replace heavy solid timbers. In Europe, wooden structures such as radio towers, one of which is 460 ft high, bridges more than 1000 ft long, an auditorium seating 75,000 persons, piers, railroad stations, etc., have been constructed by means of such connectors.

Overhead distribution lines present many opportunities for conserving critical materials, particularly by substituting wood equipment for metal. Many substitutions suggested herein are not new; in fact, many companies for years have not been permitting themselves the luxury of steel for a host of items in which wood has been found to serve the purpose; others have made good use of wood to increase impulse insulation levels as compared to those resulting from the use of steel members. The following, while not intended to be exhaustive, will give some idea of what can be accomplished in conserving critical materials by substituting:

Wood poles for steel, and iron, street lighting and boulevard light poles.
Wood pins for steel.
Wood pin brackets for pole top pins on rural type construction.
Wood pole top extensions for steel.
Wood wishbone type arms for steel.
Wood crossarm braces for steel.
Wood capacitor racks for steel.
Wood members for steel in transformer platforms and distribution substations.
Wood fixtures for steel brackets, goosenecks, mastarms, etc., for suspending street lamps.
Wood pole steps for steel.
Wood guy guards for steel.
Wood anchors (deadmen) for steel.
Steel spool bolts or wood pin brackets for steel or iron secondary racks.
Reclaimed wire butt-wrapped grounds for metallic ground rods or pipes, on new construction.
Plastic pole tags for metallic tags.
Pentachlorophenol (Permatox A) treatment for creosote.
Steel or iron wire for copper on short branches of primaries and secondaries.
Hot lines tools for rubber gloves, if this becomes necessary due to rubber shortage.

Reclaimed Material

Any used material or equipment which can be restored to use at a reasonable cost will reduce the demand for new materials. During normal times, many utility companies have conducted reclamation of certain used equipment and materials on an economic, money saving basis. The present situation has made a considerable change in the economic picture, however, and reclamation can no longer be conducted on the sole consideration of saving money, but must be governed by the ruling consideration of necessity. Present equipment and materials must be conserved and reused to the maximum practical extent. Excellent presentations of various phases of salvage programs have been made by pioneers in this field. As an observer the writer has little to add, but will take the liberty of mentioning some of the elements that appeal to him as needing emphasis in view of the advent of the "shooting war."

The following are some suggestions for initiating, or expanding, a Reclamation Program:

1—If you have not started, start *now*.

2—Decide now if you can reasonably use non-standard or obsolete equipment—if not, scrap it, because the War Effort needs much scrap metal *now*.

3—Person in charge of a reclamation operation must have ample authority. He must be able to correlate intelligently the work of existing departments. His major responsibility is to get the most out of used materials and equipment, and to reduce scrap piles.

4—Don't let the overhead in a recla-

(*Continued on page* 52)

Matching the Load and the System Capacity

By W. J. Lyman
Duquesne Light Company

Presented at EEI Electrical Equipment Committee meeting, Pittsburgh, Pa., Feb. 2 and 3, 1942

THE necessity is with us now as perhaps never before to secure the greatest possible usefulness from all of the elements of capacity on the system. Fortunately, however, we are in a better position than ever before to do this, as the result of the increased attention that has been given to the performance characteristics of equipment, in addition to the development of new apparatus and methods. The research and testing work on the effects of loading and temperature should now pay extra dividends.

There is at the present time a two-fold reason for making intelligent decisions concerning the necessity for additional capacity. In the first place, there are the well-known problems of securing and installing new apparatus and the desire to place available equipment where it will do the most good. Secondly, there is always the question of the amount of load to be handled after the national emergency is past. Naturally, there is a wide diversity of opinion as to how long the war will last and how much, if any, the load will decline when it is over. In view of the difficulties attending such load forecasting, it seems advisable to hold investment as low as possible without jeopardizing the defense program or seriously reducing the useful life of equipment. If it develops that another depression must be weathered, the advantage of having lower fixed charges would be welcome.

Many advances have been made in the science of equipment loading. It is the purpose of this paper to discuss only two phases of this subject. The first is a suggested method wherein time-temperature curves are utilized to coordinate results of heat runs, load characteristics, maintenance requirements and outage probabilities in order to determine the safe upper limits of equipment loading. The other case deals with increasing the effective carrying capacity of the transmission system by removing some of the limitations of voltage regulation and unequal loading of circuits. This has been accomplished in one case by a specially designed combination voltage regulator and phase shifter. The results obtained from this installation have been so satisfactory that a similar installation is under construction and others are being considered.

Time-Temperature Studies

The useful life of many pieces of equipment depends more than any other one factor on the operating temperature and it is generally believed that the rate of insulation deterioration is a function of both temperature and time. A few hours at high temperature may do less damage than many hours at a lower temperature. The ASA Standards for transformer operation recognize this fact and recommend progressively higher temperatures as the duration decreases. For short periods at infrequent intervals, a temperature 20 deg C higher is set than for continuous loading.

The load cycle that is carried on most equipment coupled with variations in ambient temperature throughout the year result in copper temperatures which may vary over a considerable range. This suggests the possibilities of fitting the time-temperature curve produced by the load cycle to a time-temperature curve based on the Standards.

This has been attempted for the case of induction feeder regulators and some preliminary figures will be presented here. Induction regulators were chosen primarily because some rather comprehensive tests have been run to determine the heating constants, and these furnish a means of readily computing the temperature curve for any assumed load cycle.

Two cases were considered based on different loading conditions, both using a particular type of regulator with good thermal characteristics. An indoor installation with good ventilation was assumed. The first case selected was with a high load factor intended to give results conservative enough to be applied to any circuit without making a special check on the load characteristics of the circuit. This, in effect, would be for a circuit serving a combined industrial and residential district with no appreciable seasonal variation in the load. The daily load cycle is shown on Fig. 1, simplified into three blocks which would give a maximum temperature approximately equal to that obtained by using the highest load factor to be expected in practice.

The second case is based upon a typical residential circuit where the daily load cycle is less severe and where there is a considerable drop in load during the summer. This load cycle is shown on Fig. 2. Naturally, the results of this investigation could not be applied generally and could be used only for circuits of these same load characteristics.

Industrial Load

The load cycle shown on Fig. 1 was assumed to occur five days out of each month. Loads scaled down to 90 per cent of the values shown on Fig. 1 were assumed to obtain for twenty days during the month (based on experience), and loads 80 per cent of those on Fig. 1 were used for the remainder of the month.

The ambient temperatures assumed were as follows:

January	15° C	July	40° C
February	15° C	August	39° C
March	21° C	September	36° C
April	27° C	October	29° C
May	33° C	November	22° C
June	37° C	December	16° C

On Fig. 3 are shown the results of this study. Curve A is an interpretation of the ASA Standards and is drawn in a manner to take advantage of the recurrent and emergency short time load provisions without producing deterioration in excess of that which would result from continuous operation at a temperature of 85 deg C. Assuming that deterioration doubles for each 8 deg C increase in temperature, the reduction below 85 deg C to the right of the 1500-hour point on Curve A is just sufficient to compensate for the higher temperatures to the left of this point. This assumes recurrent loads 260 days per year, and a maximum emergency loading on only two days per year. Curve C on Fig. 3 shows the calculated time-temperature curve for the entire year, using the above load cycle and ambient temperatures and assuming a monthly

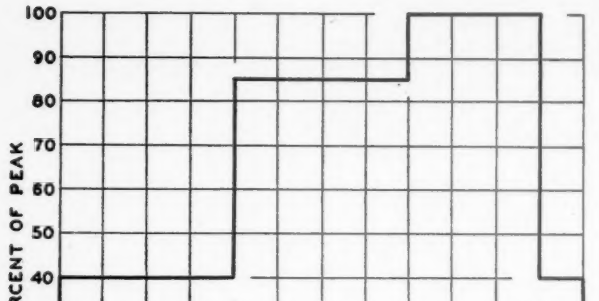


Fig. 1—Block Load Curve for Mixed Residential and Industrial Load Cycle.

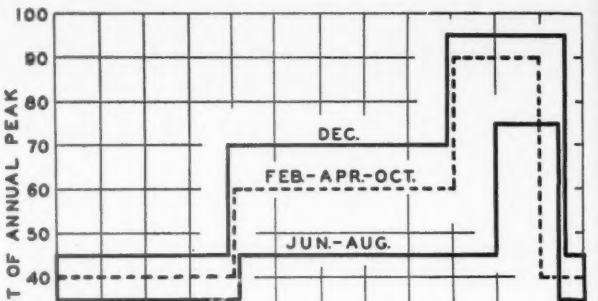


Fig. 2—Block Load Curves for Typical Residential Area Distribution Circuit.

peak equal to the regulator rating. This indicates that the operating temperatures will be well below the recommended values. Curve B illustrates the annual time-temperature curve based upon a monthly peak equal to 120 per cent of the regulator rating. Even in this case temperatures fall below the recommended values even though the average copper temperature exceeds 85 deg C for a portion of the year. It is believed that this comparison gives a clearer picture of the relation between actual operating temperatures and desired limits than can be obtained by spot checks of only a few boundary conditions. Since the curves of actual operating temperature B and C for each hour of the year, are always below Curve A, the deterioration for the year would be less than would result from following the allowable upper limits.

In many cases, distribution circuits are provided with ties to adjacent circuits which can be closed in order to supply load during emergencies or for maintenance and construction purposes. With these ties there is a possibility of the regulator carrying more load under certain conditions. If it is assumed that each circuit has a tie to two other circuits, there is a theoretical possibility of having a 50 per cent overload in case a feeder fails during the peak load period. An investigation of the many factors influencing this possibility shows that the probability of serious overloads from this cause is rather remote. Operating experience has also verified this fact.

It is well to know, however, how much leeway is available to pick up additional load without exceeding the recommended temperature for short periods of time. Curve D on Fig. 3 shows how many days during the year various percentage increases can be picked up on the regulator, based upon a monthly peak equal to the rating. These are percentages of the peaks actually carried each day and are not percentages of the regulator rating. It is evident that a 50 per cent additional load can be carried (through a 24-hour period) on about half of the days during the year. Thus, while it is not possible to carry much additional load at the time of the monthly peak during the summer, there are still many periods when considerable increases can be taken, and this would furnish a basis for judging whether or not any special provision should be made for this possibility.

Residential Load

The results of an analysis for a typical residential load cycle are shown on Fig. 4. This is based on a cycle shown on Fig. 2, with appropriate allowance for seasonal and monthly variations. The shape and magnitude of the 24-hour cycle is seen to vary considerably for the different seasons. (Curve shown only for every other month).

It was assumed that the monthly peaks were carried five days each month, 88 per cent of these loads twenty days per month, and 80 per cent of the values shown for the remainder of the month.

Fig. 4 illustrates that with a December peak equal to the regulator rating, the annual time-temperature curve is far below the allowable upper limit. As a matter of fact, for this particular type of regulator and the other conditions assumed, the December peak could equal 150 per cent of the regulator rating without exceeding the recommended temperature limits.

Curves E, F, and G on Fig. 4 demonstrate how much additional load could be carried for various portions of the year in event of breakdown on an adjacent circuit or for purposes of maintenance and construction. If the practice is followed of carrying a December peak equal to 120 per cent regulator rating, it would still be possible to pick up an additional 50 per cent load on all except fifty days during the year.

The above data have not been presented for the purpose of establishing any definite ratings but only to illustrate how, in certain instances, it may be desirable to obtain a clearer picture of what is going on inside the equipment with respect to dangerous operating temperatures. Additional studies along this line will be necessary before arriving at any definite conclusions. This same procedure could be applied to transformers, cables, and certain other equipment. This method would also furnish a reliable basis for investigating the much talked of problem of overloading vs. reduction in life. Since deterioration in many cases is a function of time and temperature, an analysis such as this would show how much deterioration could be expected from loading practices which would run the copper temperatures above the recommended upper limits.

22 Kv Voltage Regulator

One of the problems encountered in attempting to obtain the maximum use of the system equipment is the loading

of the transmission system. Two important factors here are the non-uniform loading in many cases between circuits feeding the same area and the limitations due to voltage regulation. Certain features of this problem were studied on the Duquesne Light system and in one case this led to the installation of a rather unique regulating transformer, which can be used either as a voltage regulator or phase shifter. This installation goes a long way toward solving these two problems.

In recent years there have been many improvements in relaying and circuit breaker operation as well as in other equipment and also in protection against lightning. This trend has a tendency to increase the loading of transmission circuits. In fact, some of these improvements have been partially justified on the basis of postponing or making unnecessary certain increases in capacity.

Another trend which has been quite general is the increasing of circuit ratings, both normal and emergency, by increases in thermal ratings of cables and open wire and by removing bottlenecks by the reinforcing of short pieces of cable and terminal equipment, etc.

Thus, it is probably true that voltage regulation will become a limiting factor in an increasing number of cases.

Voltage regulators in series with the 66/22 kv banks at the transmission substations would serve several useful functions but would also have certain limitations. In most areas, some of the load is located near the station and some much farther away, so that it would not be possible for bus regulators to give a large boost to one of the longer circuits without producing abnormally high voltage at the nearby load. Another consideration is the rapid growth in load supplied directly from the 66-kv lines. At locations where this is a factor, it requires that the 66-kv voltage be carefully controlled, which in turn would tend to keep the general range of voltage on the 22-kv buses within reasonable limits.

The above conditions, among others, led to the proposal to install a regulator at the Ambridge Substation capable of regulating one circuit at a time. By connecting this regulator to the auxiliary bus, it could be used on any one of the seven 22-kv circuits leaving the station. Normally, it would be used on the circuit mostly in need of regulation and in an emergency could be switched to any other line.

The other problem arises from the unequal division of load among the feeders due to differences in route, substations connected thereto, and line impedances. Normally, with all lines in service, this unbalance is not serious, but during periods of line outage due to breakdown or maintenance or with unusually heavy loads, such as are now being experienced, such an unbalance

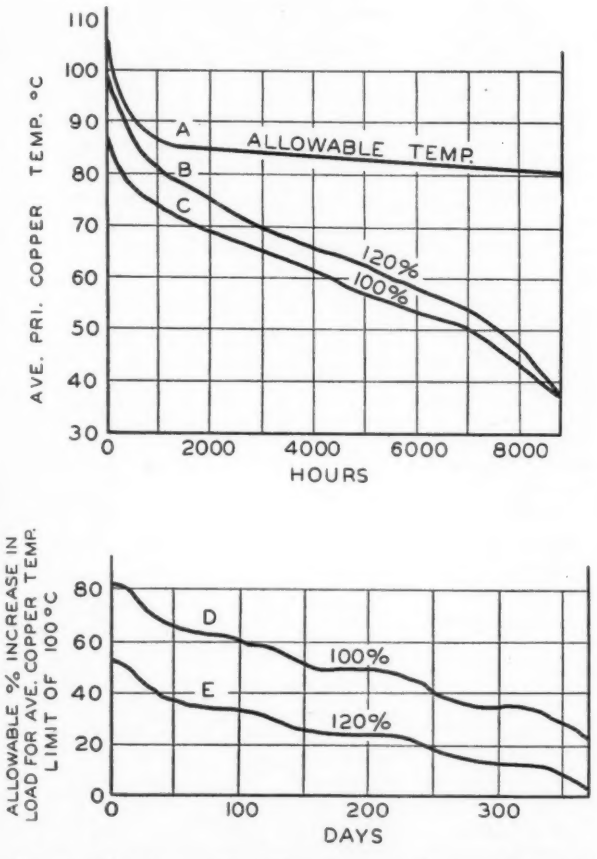


Fig. 3—Regulator Time-Temperature Curves Industrial Area—No Seasonal Variation.

Percentages on curves refer to ratio of monthly peaks to regulator name-plate rating.

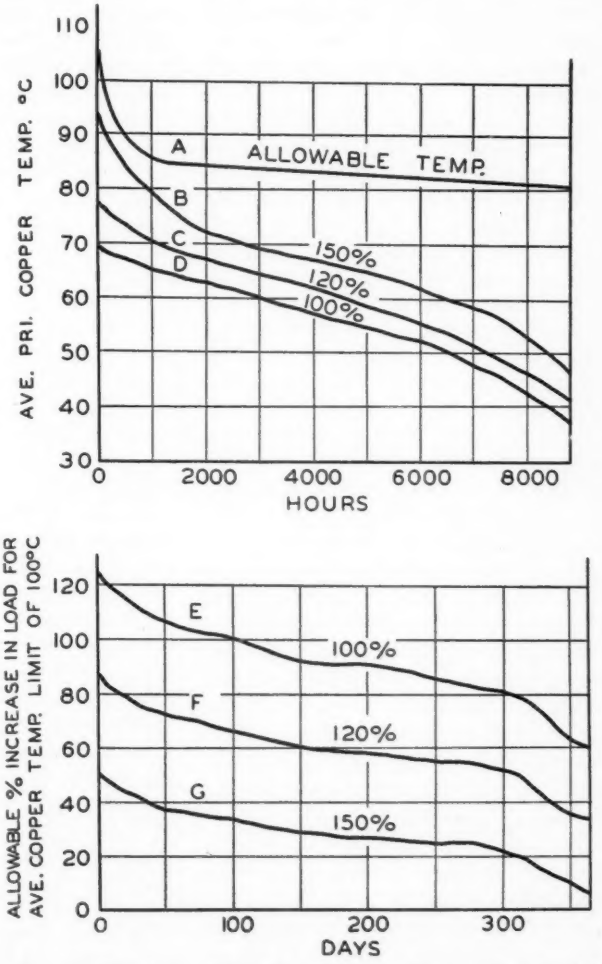


Fig. 4—Regulator Time-Temperature Curves Residential Load Cycle.

Percentages on curves refer to ratio of December peak to regulator name-plate rating.

may seriously limit the safe loading and thus reduce the allowable load to be carried on the transmission system. A regulator connected as a phase shifter could be used to buck down the load on a heavily loaded line or boost the load on a lightly loaded circuit. This could easily produce a valuable increase in the effective capacity of the lines and eliminate or postpone the addition of more capacity.

A firm power rating is placed on the transmission substations of the Duquesne Light Company which is equal to the short time rating of the transformers with one bank out of service, plus the load that can be transferred over interconnecting 22-kv lines to other transmission substations. During such an emergency a phase shifter, in a line to another station, could shift load without disturbing the duplicate feed to intervening stations and without the serious drop in voltage that might result from simply opening a line and letting it feed from the other end. Thus, the firm power rating would be effectively increased.

As a result of these considerations, a 22-kv, 12,000-kva, 10 per cent regulator was installed at the Ambridge Substation and connected to the transfer bus. This regulator can boost or buck 10 per cent, either in phase with the bus voltage or at an angle of 30 deg, 60 deg, or 90 deg. "No Load" tap changers, conveniently located, are used to change from one angle to another or to change from the boost to the buck position.

Comprehensive load tests, together with operating experience, have demonstrated that this regulator can readily control voltages and balance loads under a variety of conditions. The net result has been to increase the effective capacity of the 22-kv transmission system in this district and also to increase the firm power rating of Ambridge Substation by shifting load to other transmission substations. These improvements have a value much greater than the cost of the regulator installation. Many occasions have already arisen where the regulator has been very useful and its advantages have been thoroughly proven.

A new power station is now being constructed about a mile from the Ambridge Substation and will be connected into the existing 66-kv and 22-kv circuits. Another regulator will be installed at this power station similar to the one now at Ambridge Substation, but with a 16 per cent maximum boost instead of 10 per cent. This regulator will be connected permanently in a 22-kv circuit feeding into the Coraopolis-Neville Island district, where a number of large industrial customers are located. This district will be supplied by four circuits; one from the new power station, the Sewickley circuit from Ambridge Substation, and two circuits from the Brunot Island Power Station, located 15 miles from Ambridge. This regulator, together with the one at Ambridge, with the latter connected in the Sewickley circuit, will make it possible to regulate voltage in the Neville Island district and also fully utilize the capacity of the four 22-kv circuits feeding into this area from three different sources. Investigations made on an AC calculating board have demonstrated that the balancing of load between these circuits in this manner will take the place of a new 22-kv transmission line into the area which would cost probably two or three times as much as the regulator installation.

Conservation of Critical Materials

(*Continued from page* 48)

mation program become elaborate. Keep paper work to a minimum.

5—Specifications for reclaimed materials should be well understood by those who do the reclaiming and by those who use the reclaimed materials.

6—Give first consideration to those items in which a shortage looms, or those which are most useful, easiest to handle and which require a minimum of special tools and equipment.

7—Save *all* waste, scrap and junk materials such as iron, steel, copper, aluminum, rags and paper for prompt disposal to authorized dealers. Impress upon all employees the need for saving such junk items, even to the smallest pieces.

8—For the ears of the manufacturers, it might be mentioned that one of the most urgent items of reclamation programs is the processing of old wire for re-use; and a question very frequently heard is: "Where can we buy a machine for stripping the braid off old weatherproof wire?" There are a number of home-made machines in use and at least one small factory is in position to supply a light manufactured machine. But there are none nationally advertised. Of the home-made designs with which we are familiar most employ the principle of splitting the braid by crushing between rolls, rather than cutting by a rotary knife as in one of the pioneer designs. This is mentioned merely to bring out that the "brute-strength" method can be employed successfully, if it happens to fit in with materials on hand for constructing a machine in any particular situation.

Conclusion

It is our patriotic duty as engineers and operators to find new ways to substitute non-critical materials for critical, and to conserve what we have now—to make it last longer. Engineers must change their philosophy of materials for construction. The more we learn now about the use of substitute materials and reclaimed materials for overhead lines the easier it will be to keep operations going when a real shortage of materials develops.

Let us also emphasize the need for simplification and unification of overhead lines equipment, looking toward the elimination of unnecessary sizes and varieties of manufactured articles. Also, maximum unification of demands for raw materials can be accomplished by accepting material specifications of authoritative sponsorship, national recognition and demonstrated adequacy, and will assist to defer the necessity of accepting substitute materials. We can use prevailing conditions to insist upon more standardization work and reduce number of different sizes, types and kinds of materials and equipment. Many frills can be eliminated and such standardization cannot help but speed up the procuring of materials and will save much time in our own, and manufacturers, organizations.

Maryland Association Meeting

THE spring meeting of the Maryland Utilities Association will be held at the Lord Baltimore Hotel, Baltimore, Maryland, on Friday, April 17, 1942. The entire day will consist of a combined meeting of the Gas, Electric and Transportation Groups. There will be three speakers at the morning session covering the subjects of Sabotage, Priorities and Personnel. The afternoon session will be addressed by Mr. DeLoss Walker. The annual election of Officers and Directors will follow Mr. Walker's address.

Effects of Pole End Bonding in Lightning Arrester Protected Cable Installations

By N. B. Walsh
Duquesne Light Company

Presented at EEI Transmission and Distribution Committee meeting, Cleveland, Ohio, Feb. 10, 1942

DURING the year 1941, the Duquesne Light Company 22-kv transmission system suffered 28 cable failures of which nine, or 32 per cent, were due directly or indirectly to lightning. This leading cause of dielectric failure led to an investigation of the lightning arrester protection afforded cables by the present installation standard. A brief survey disclosed a variety of installations, with respect to location of the lightning arrester and bonding methods. With this in mind, it was suspected that the lack of protection might not be due entirely to the lightning arrester alone (of which there were several types) but very probably also involved the method of installing, especially with respect to the grounding system. Towards this latter end, a test was arranged whereby the position of a lightning arrester with respect to a pothead and cable, and the bonding could be varied, and the entire installation subjected to impulse voltages of constant characteristics.

1. EQUIPMENT

The test set-up (Fig. 1) consisted of a 30-ft pole upon which were mounted crossarms, a pothead and single-conductor tail, and the lightning arrester. The pothead was placed about 25 ft above the ground and the tail end passed through a 90° pipe bend at the foot of the pole and terminated in an oil tank, the total length of cable being about 70 ft. Provision was made to mount the lightning arrester either on the top crossarm in its normal position (present standard for one type construction) or on the same mounting bracket supporting the pothead. A ground wire was run the full length of the pole in the usual manner and grounded at the base of the pole. Due to the wide variations of lightning arrester ground resistance of the numerous installations existing on the system, the tests were made with the ground lead solidly grounded and again with 23 ohms in the ground lead—23 ohms merely representing an arbitrary ground resistance. The entire layout was erected in the high-voltage test laboratory of the Duquesne Light Company.

2. TESTS

Recognizing the possibility that the inductive voltage drop $(L\frac{di}{dt})$ in the lightning arrester ground wire during an impulse might become quite sizable depending upon the length of wire and the *rate* and *rise* of the current surge, the conclusion was reached that the best possible protection (lowest voltage on the cable) should be secured by mounting the lightning arrester as close to the pothead as possible, making its ground connection directly to the pothead and cable ground system. This obviously reduces the length of ground lead to a

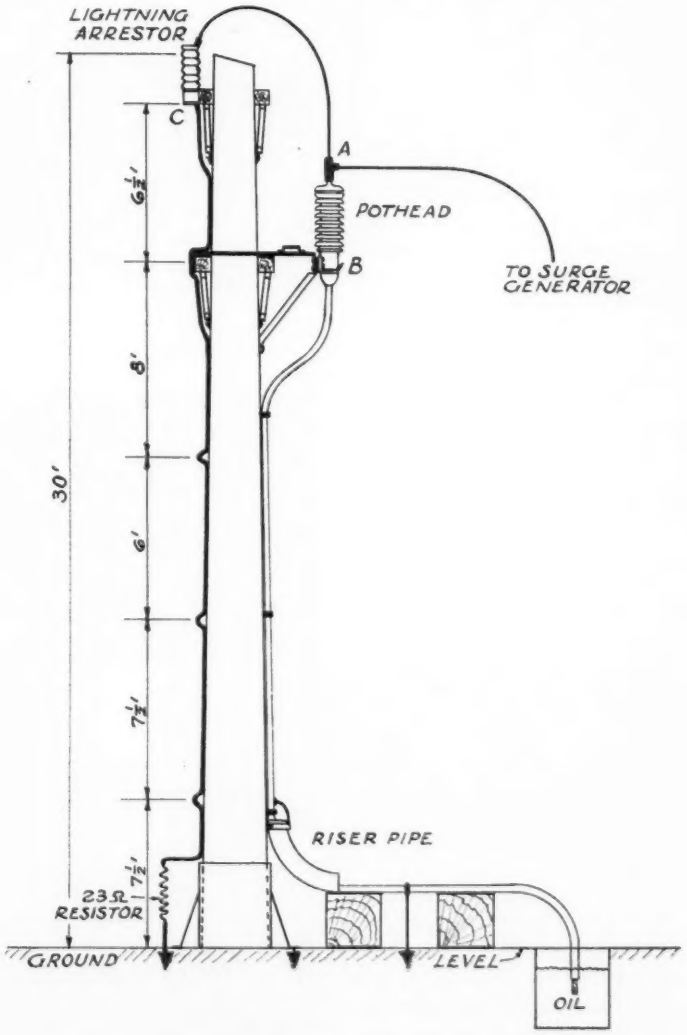


Fig. 1—Lightning Protection of Cables, Test Equipment

minimum, which in turn reduces the inductive drop and hence the total voltage existing on the equipment.

To obtain substantiating data toward this end, the length of ground lead was varied between the limits of above-mentioned theoretical minimum and the maximum, or condition of no bonding. This length was varied merely by bonding at intermediate points between the top and bottom of the pole. The surge generator remained at a constant setting throughout the tests to assure uniformity.

In all cases, voltages were measured at the top of the pothead and lightning arrester, the base of the pothead, and the base of the lightning arrester. Where possible, the current was also measured.

A lightning arrester of 25-kv rating, hereafter referred to as Type "A," similar to many in service on the Duquesne Light Company system, was used in the investigation. In addition, to obtain comparative performance of other types of arresters in service under these conditions, three additional arresters were secured and will be referred to as types "B," "C" and "D." All four arresters were observed under identical test conditions.

The testing procedure consisted merely of subjecting the apparatus to a steep current surge and, by means of a cathode ray oscillograph, recording the resultant voltage and current waves at the various points. The current wave reached its 6000 amp crest in about 1½ microseconds and decayed to zero in some cases just as quickly. Obviously, since only one oscillograph was available for the test, all the voltages for any one test could not be measured simultaneously. This was of some benefit, however, as will be seen from the oscillogram. The effect of the 23 ohm ground on the protection afforded was discovered to be quite small. Therefore, the oscillograms for this condition will be omitted and only the solidly grounded case considered. The results can best be shown by the oscillograms and the curves derived from them.

Fig. 2 represents the installation with the lightning arrester mounted directly on the pothead bracket and bonded to the pothead base. Here the voltage is 170 kv.

Fig. 3 represents the installation with the lightning arrester mounted on the top crossarm in the usual manner with the ground wire bonded to the pothead at the bracket 6½ ft below the lightning arrester. The voltage has risen to 193 kv. The voltages at the base of the arrester and the pothead are shown as

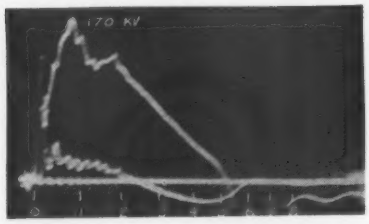


Fig. 2

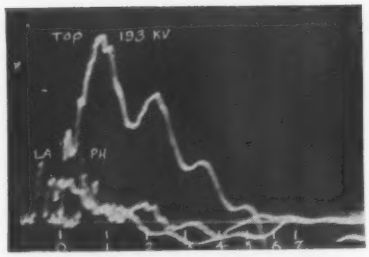


Fig. 3

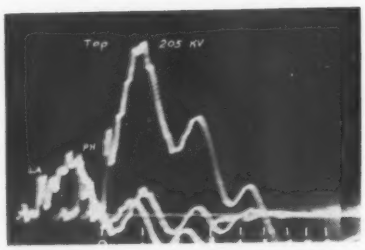


Fig. 4

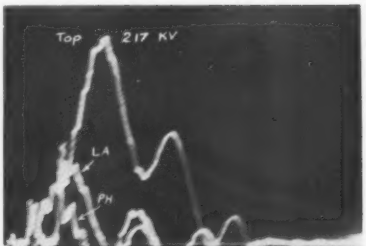


Fig. 5

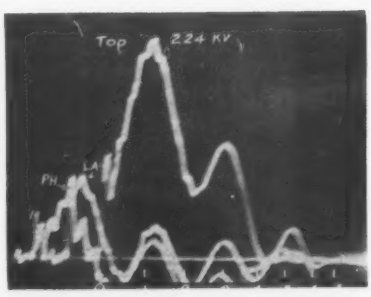


Fig. 6

starting from different points. This shift was purposely made to avoid confusion in the picture.

Fig. 4 shows the voltages when the bond was moved to a point 20½ ft from the arrester. The voltage has now reached 205 kv. To obtain the voltage across the pothead itself we must subtract the pothead base voltage from the overall voltage. This will be seen later.

In Fig. 5 the bond was 28 ft from the arrester, at the top of the 90° pipe bend. The voltage has now become 217 kv. When we subtract voltages, we must be sure they are the voltages occurring at the same instant of time.

Finally, in Fig. 6 we have the condition of no direct bonding between the lightning arrester ground lead and the cable. Starting with 170 kv, the voltage has risen to 224 kv merely as a result of lengthening the lightning arrester ground path.

The important data from these oscillograms have been accumulated in curve form and can be observed in Fig. 7. Here both the 23 ohm and solid ground conditions are shown:

Curve A represents the overall potentials above ground impressed on the pothead for the condition of a 23-ohm ground resistance.

Curve B is the same for a solidly-grounded condition.

Curves C and D show the voltage at the base of the arrester for the 23-ohm and solid conditions, respectively.

Curves E and F show the voltage at the base of the pothead for the 23-ohm and solid conditions, respectively.

In obtaining the curves C, D, E, and F, it will be remembered that the voltage at the instant corresponding to the crest overall voltage was used, not the peak voltage, which occurred usually at a different time than did the overall voltage peak. Thus, with the voltages referred to the same instant, we can obtain the voltage across the lightning arrester itself, independent of the ground lead, by subtracting curves C and D from A and B respectively. Likewise, the kv across the pothead may be obtained by subtracting curves E and F from A and B. These voltages are shown in Fig. 8. The gradual decrease of curves C and D from an absolutely constant value may be due to increasing amounts of resistance in the circuit limiting the current discharged.

Thus, merely by shortening the length of ground lead in our present installations, we may reduce the voltage im-

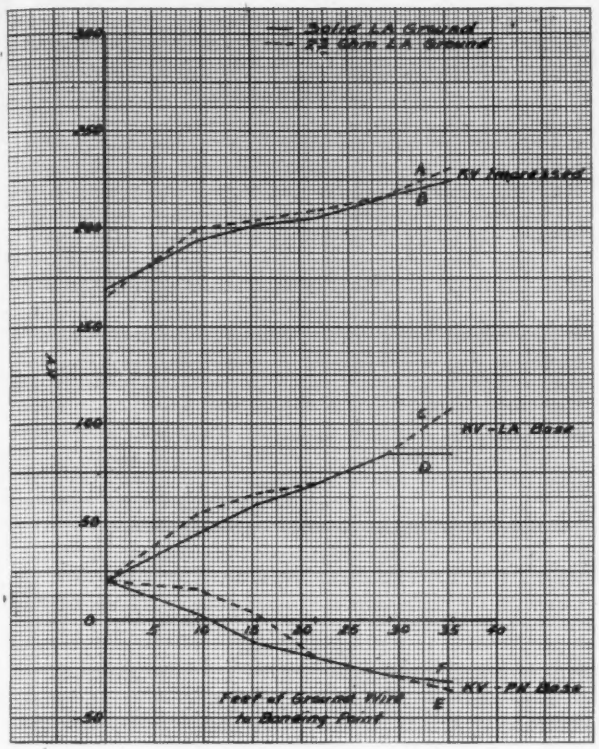


Fig. 7—Cable Terminal Lightning Protection

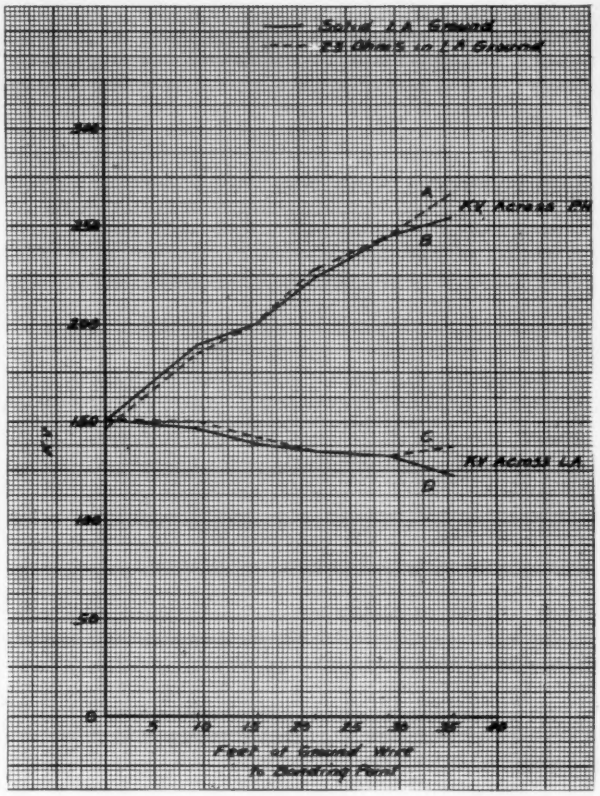


Fig. 8—Cable Terminal Lightning Protection

pressed on the cable terminal by 100 kv, and the voltage impressed on the solidly grounded portions of the cable plant by at least 55 kv, for this type surge and arrester. And since it is almost wholly a question of inductive drop, the steeper the wave front the greater is the effect of the bonding on the protection achieved.

The remaining three types of arresters previously mentioned were next tested one at a time at the same position on the pole and with identical bonding. The voltages of type "B" are shown in the oscillogram of Fig. 9, where the voltage reach 251 kv. The current discharged is 4730 amperes.

The oscillogram in Fig. 10 shows the voltages of type "C" arrester. Here the voltage went off scale, but was estimated by shape to be 294 kv, and the discharge current is 2320 amperes. The relatively high impedance of this arrester allowed the voltage to rise excessively and tended to slow up the current wave front and limit its value. As will be seen shortly, the current discharged by the arrester used in the previous tests was about 6000 amperes, or almost three times that shown here.

The voltages and currents have been accumulated in graph form and are shown in Fig. 11. The abscissa represents the first three types of arresters mentioned. Type "D" was also tested, and its characteristics were practically the same as type "A." Being a later model, it has a slightly larger discharge capacity.

While type "C" arrester was being used, the pothead failed. Although potheads under usual conditions are regarded as having an impulse strength well in excess of the 294 kv which this arrester permitted, the conditions at this time of

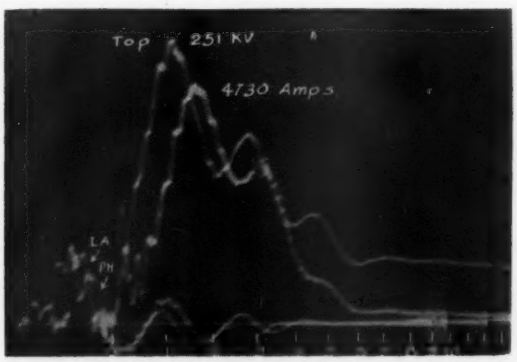


Fig. 9

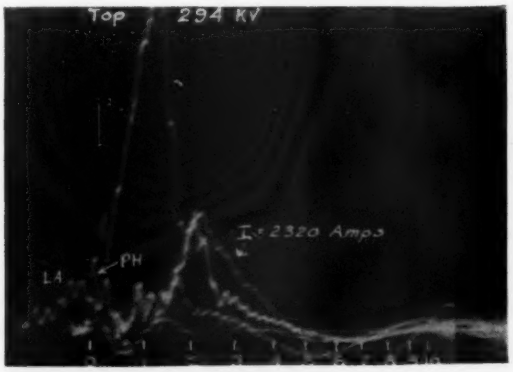


Fig. 10

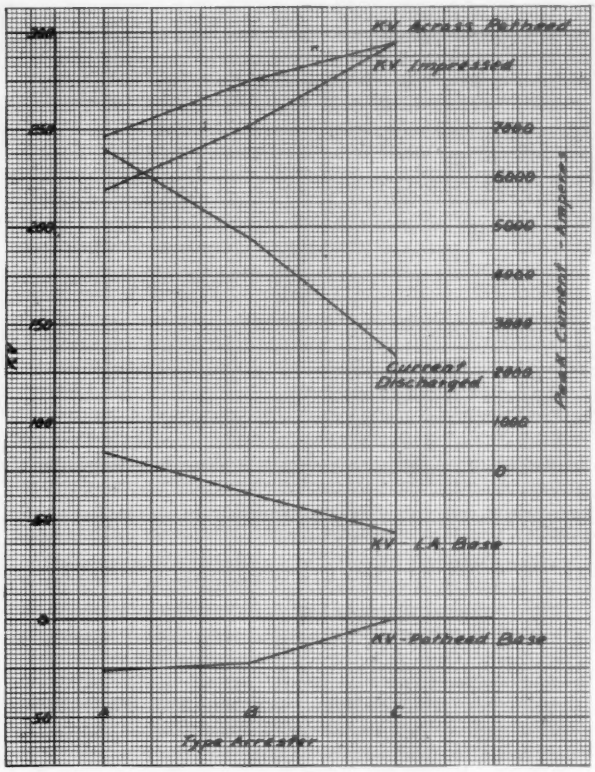


Fig. 11—A Comparative Performance of Three Types of 25-kv Lightning Arresters

the test could hardly be considered usual, inasmuch as the pothead had withstood approximately 450 surges in previous tests, which obviously lowered its impulse strength.

Some question might be raised as to the reason for using a current of the wave shape shown in Fig. 12. This is the current previously mentioned which was discharged by the type "A" arrester. The average rate of rise is about 4000 ampere per microsecond, with a crest of approximately 6000 amperes, depending on the test condition and an average time to crest of about 1½ microseconds. However, it seems reasonable to use such a wave shape on the basis of data* (although relatively meager) obtained from field measurements of the wave shapes of lightning surges where it was disclosed that about 80 per cent of lightning stroke currents have a crest of 6000 amperes or greater, but only about 3.5 to 9 per cent of arrester discharge currents each a crest of 6000 amperes or more.

Probability curves indicate that we may expect from 60 to 170 arrester discharges per year with a crest of 6000 amperes or greater, on a basis of 1000 single-phase arresters in service. This, of course, depends largely on location of the arresters and type of line construction.

However, while current peaks and

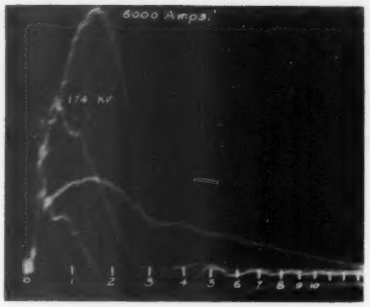


Fig. 12

duration are of considerable importance, from the standpoint of the performance of arresters themselves, it is the *rate* of *rise* of the currest which must be considered from the standpoint of the performance of the entire *installation.* It has been calculated from magnetic field measurements that about 75 per cent of all lightning surges have a current rise of 4000 amperes per microsecond or greater. Thus, while we needed a rather steep current front to show up sufficiently the inductive voltage produced, such a wave is certainly not a theoretical one alone.

We might state it this way:—under the old conditions of bonding, we had good protection for only one class of surges, currents of low rate of rise and long duration. This protection was limited entirely by the arrester itself, regardless of any type of bonding. For currents of a high rate of rise, the pro-

(*Continued on page 76*)

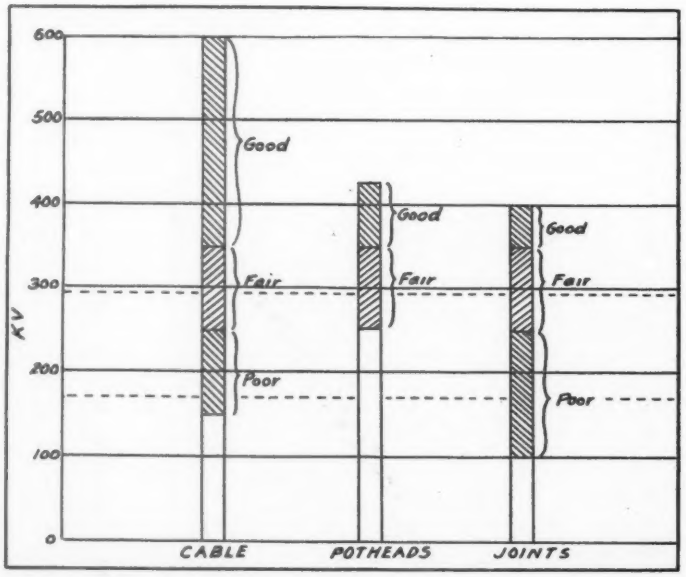


Fig. 13—Approximate Insulation Impulse Breakdown Values for 22 kv Underground Equipment

* Wagner, McCann, Part III, Oct., 1941, *Elec. Eng.*, page 499.

The Preservative Treatment of Wood With Pentachlorphenol

By Dale Chapman

A. D. Chapman & Company, Inc., Chicago, Ill.

Presented before the Transmission and Distribution Committee Meeting, EEI, Cleveland Hotel, Cleveland, Ohio, Feb. 10, 1942

As the name implies, pentachlorphenol is a highly chlorinated phenol—chlorinated to the fifth degree. In fact, pentachlorphenol is simply phenol, or carbolic acid as you may know it, chlorinated to its maximum extent. The prefix "penta" is used because 5 chlorine atoms are hooked chemically on to each molecule of phenol. There are other chlorinated phenols, such as tri and tetrachlorphenol, but since pentachlorphenol is the most suitable of them all for wood preservation, we shall confine our discussion almost entirely to it.

Pentachlorphenol is not a new chemical. It has been made in chemical laboratories for many years—more than 100—but has received significant attention only within the past 15 years. It was recognized many years ago as possessing excellent wood preservative properties, but only in recent years has its cost been low enough to attract commercial attention.

Physically, pentachlorphenol is a dry, crystalline chemical, moderately soluble in most petroleum oils and organic solvents, but very sparingly soluble in water. In fact, its extremely low solubility in water, which is in the order of only about 20 parts per million, and its very low vapor pressure, or tendency to volatilize, are the two most important reasons for its high permanence, and we all know that permanence is a prime requisite of a long lasting wood preservative.

Another prime requisite of an effective wood preservative is a high degree toxicity to fungi and insects which cause wood to deteriorate in service. Pentachlorphenol has very high toxicity to wood decaying fungi and to termites. The toxicity appears to be from 10 to 100 times that of coal tar creosote, depending upon the creosote and the methods of testing toxicity. When dissolved in oil to a concentration of 5 per cent by weight—which is the strength of the usual treating solution—the toxicity is at least equal, and in most cases considerably higher than the toxicities of the coal tar creosotes in common use. Since pentachlorphenol is essentially a tar acid, and moreover, one which possesses lower water solubility and vapor pressure, plus higher toxicity than any of the constituents of creosote, its 5 per cent solutions should, from a purely theoretical viewpoint, be regarded as comparable to coal tar creosote.

Results of Service Tests to Date

While the physical, chemical and toxic characterisitcs are all important in judging the worth of a wood preservative, its final evaluation can only be determined by actual service tests. As early as 1931, typical 2 x 4 test specimens were treated by the Forest Products Laboratory with alcohol and petroleum solutions of tetrachlorphenol, and these were followed in 1934 by field tests on fence posts, pressure-treated with solutions of tetrachlorphenol in waste crank case oil. In 1936 and 1937 pentachlorphenol solutions were also used, the specimens also being treated by the Forest Products Laboratory and installed in test plots in the South. Periodic examination of this test material shows that pentachlorphenol and tetrachlorphenol solutions are giving excellent results.

In 1935 two large test plots of our own were established in the South, one in southern Louisiana and the other near Jacksonville, Florida. Fifty-five different preservative compositions, both water-soluble salts and oil solutions, and including the proprietary preservatives in use today, were used in from two to four different absorptions in southern pine sapwood specimens. During the six-year test period to date, many of the treatments have shown partial or entire failure under the relatively severe conditions of soil exposure to both decay and termites. All of the test specimens treated with fuel oil solutions of pentachlorphenol are still sound and free from termites and decay.

It might be worth while here to quote the following consecutive paragraphs from a very recent paper by Mr. George M. Hunt, Chief of the Section of Wood Preservation, of the Forest Products Laboratory, with regard to these tests on the chlorinated phenols:

"These experiments do not settle the question of the relative effectiveness of creosote and solutions of chlorinated phenols, nor do they determine the optimum concentration of solution or absorptions to be used with such solutions. They indicate, however, that petroleum solutions of pentachlorphenol and of tetrachlorphenol, when of sufficient concentration and retention, can give a high degree of protection against decay and termites and are promising materials to use when creosote is hard to get or is too expensive. It is highly desirable that all other obtainable data from experiments and from use experience with these preservatives be made available as soon as possible.

"Pentachlorphenol and tetrachlorphenol are much more versatile preservatives than creosote for they are sold as technically pure solids or in concentrated solutions and can be carried in a variety of solvents. Where stronger solutions than 5% are required they can easily be made. Where practically colorless treatment or non-bleeding treatment is desired, it can be obtained by choosing suitable solvents. In using creosote-petroleum solutions with a low concentration of creosote, pentachlorphenol may be added to increase the toxicity."

Commercial Use to Date

The first extensive commercial use of pentachlorphenol oil solutions was by the millwork industry, who several years ago adopted these solutions and those of other chlorinated phenols as standard treatments for the preservation of sash, frames, doors, and other millwork products. Considerable earlier experience, however, had been obtained with the water-soluble sodium salts of the chlorinated phenols in the control of sap stain and mold in air-seasoned lumber, in the preservation of fibre board and insulating materials from decay and termite attack, and in the control of mold and slime formation in the pulp and paper industry. The most recent large development for pentachlorphenol solutions has been in the pressure and non-pressure preservative treatment of poles, lumber, posts and railroad crossties.

Pressure Treatment with Pentachlorphenol Solutions

Considerable quantities of pine lumber, poles, piling, and crossarms have been pressure-treated with pentachlorphenol solutions during the past year. The lumber is being treated with 6 to 10 lbs of 5 per cent pentachlorphenol solutions per cu ft of wood, and is used largely in the construction of homes, factory buildings and bridges. Poles and crossarms are being treated with 8 to 12 lbs of this solution and are being furnished to utility companies. For the lumber going into the construction of homes and buildings, a clean, non-discoloring light fuel oil is used as the solvent-carrier for the pentachlorphenol, and after a few weeks of drying, this clean, dry, treated lumber can be painted very satisfactorily. For poles and crossarms and other products where a neutral or brown color is desirable, the pentachlorphenol is dissolved in a dark fuel oil which will not only adequately show the extent of penetration of the preservative solution, but at the same time will leave the pole clean, dry, and free from bleeding, when used in absorptions up to about 12 lbs per cu ft.

In all of this pressure-treatment work, the standard treating methods employed for creosote are used, except that in some cases somewhat lower treating temperatures and pressures are possible—owing to the lower viscosities—when the lighter oils are used as solvents. Owing to the use of low viscosity oils, the penetration and diffusion of preservative have been better than with high viscosity solvents.

Non-Pressure Treatments with Pentachlorphenol

During the past year also, very considerable quantities of cedar poles have been given a clean non-pressure treatment with pentachlorphenol solutions in light fuel oil, using immersion periods ranging from 2 to 10 hours, and solution temperatures from about 70° F to 150° F, depending upon the condition of the wood, to obtain absorptions averaging 4 to 5 lbs of solution per cu ft of sapwood on a ½ in. depth basis. The depth of penetration varies, as one would expect, but ranges from about ¼ in to ⅝ in. This is considerably better than those obtained with oils of higher viscosity. The absorption of 5 lbs of solution, or 0.25 lb of dry pentachlorphenol per cu ft of sapwood, should protect the sapwood above the ground-line for the service life of the pole. Tests and observations made to date indicate that as the treated sapwood weathers, sufficient pentachlorphenol diffuses inward to effectively protect the sapwood from the so-called "shell-rot" condition.

While the present treatment is designed to protect the sapwood only above the ground-line, it appears likely that the use of a somewhat more concentrated hot solution and longer immersions will result in sufficient penetration and absorption in the incised ground-line area to permit both butts and tops to be treated in a single operation, omitting the creosote entirely.

Cedar Poles in Service

After an untreated cedar pole has been in service four or five years, the above-ground sapwood usually becomes porous and absorptive as the result of weathering. There is every evidence that such a pole can be adequately treated against "shell-rot" by spraying with a 5 per cent pentachlorphenol solution.

One large utility company is thus spraying several thousand cedar poles, using specially designed portable spraying equipment, with hooded spray nozzles to prevent loss of solution. The poles readily absorb the required 5 lbs of pentachlorphenol solution per cu ft of sapwood and complete penetration of the sapwood is obtained.

Many utility companies reclaim their untreated, or superficially butt-treated, used cedar poles, cutting them off at the ground-line and treating by dipping and soaking the butts of these shortened poles. The sapwood of these used poles is normally very absorptive and can be readily and effectively treated by cold soaking in a 5 per cent pentachlorphenol solution. The tops may be treated by spraying.

Douglas Fir Crossarms

Fir crossarms can be treated very effectively using pressure, particularly with the low viscosity pentachlorphenol solutions. Non-pressure methods are more economical and more generally used, however, if satisfactory penetrations and absorptions can be obtained thereby. While short cold-soaking treatments may be of considerable value in preservation, it appears from our work to date, that a fully effective preservative job can only be obtained by a combination hot and cold bath treatment, using a hot bath of at least 200° F for 4 to 7 hours, followed by a cold bath for 2 to 16 hours, resulting in absorptions of about 2 lbs of solution per cu ft of total crossarm, and penetrations sufficient to give protection in the vulnerable pin hole areas.

It is apparent from the above that pentachlorphenol solutions offer certain advantages over the present creosote and the salt preservatives. Compared with creosote, wood treated with pentachlorphenol solutions is clean, dry, non-bleeding, paintable, and easily and safely handled by workmen, and the preservative penetrates better and is more uniformly distributed through the wood. Compared with clean, water-soluble salt treatments, much more permanent protection is provided; and the cost, trouble, and checking losses encountered in redrying salt-treated wood are avoided. Furthermore, pentachlorphenol solutions are strictly non-electrolytes, present no conductivity problem or hazard, and are non-corrosive to pole line hardware.

Pentachlorphenol and Present War Conditions

Not only can pentachlorphenol-fuel oil solutions be used alone to advantage, but they can also be mixed with creosote to conserve supplies of the latter, reduce the cost of the treating solution, improve the penetration, and reduce bleeding, which of course becomes more pronounced as the residue content of creosote is increased, as has been the case during the past several months. In addition to the pole-treating plants now using straight pentachlorphenol solutions, there will no doubt soon be others who will treat with a 50-50 mixture of pentachlorphenol-fuel oil solution and creosote. Since 5 per cent pentachlorphenol-fuel oil solutions can be prepared at large treating plants at a cost as low as 11c. per gallon, and with creosote costs now ranging from 13c. to 15c. in the East to about 28c. per gallon on the West Coast, it is obvious that treating costs can be substantially reduced with the use of the former. Supplies of creosote are likely to become more scarce under war conditions, and there probably will be some curtailment of pentachlorphenol. However, it is quite certain that there will be substantial quantities of pentachlorphenol available, and considering its versatility and suitable character, it would appear very much worth while for all users of treated poles and other wood products to consider the installation under their own service conditions of substantial quantities of pentachlorphenol-treated material. These installations will provide experience and service records when supplies of all preservatives again become plentiful, and when utilities will want to decide which preservatives have the most value for their uses.

Conserving Man Power By Effective Health Education

By John J. Brandabur, M.D.

Assistant Supervision Surgeon, Chesapeake & Ohio Ry. Co.

One of a series of articles sponsored by the Accident Prevention Committee of the Edison Electric Institute

THE loss of capably trained men from any industry today whether by accident, occupational disease or non-occupational illness is a liability which cannot be measured in dollars and cents but must be evaluated on a humanitarian standard of the number of lives that can be saved in the holocaust of this destructive war. The loss of one capably trained man here may mean the loss of life of some one near and dear to us on the battlefront.

During a time like this it seems paradoxical to speak about saving or prolonging life by effective industrial health education, yet in order to carry on a successful fight to a righteous peace we in industry must make every effort to conserve man power . . . not only through accident prevention by the safety department but also by educating the employee to understand that ordinary illnesses play a role in the causation of accidents and that the environment of his working conditions have very much to do with whether a man is a safe employee so that he can finish the day without being a hazard either to himself or to his fellow employees or to the public.

• • •

This can and must be done through the medical director of your organization, by providing reasonable first aid and advice for the employees suffering from non-occupational diseases through a cooperative relationship with the family physician. For example: by his detailed examination of the employee's work the industrial physician is able to give invaluable assistance by acting as investigator and advisor for the family physician. The industrial physician can also help to alleviate the shortage of skilled workers by scientifically evaluating the capabilities of those who hitherto have been unemployed by physical disabilities.

Since in this era of mechanization the very nature of industry demands efficient well geared and high powered machinery, it at the same time must make convenient safe and comfortable provisions for the streamlined expansion of all industry with adequate and efficient mechanical equipment. By the same token the efficient operation and care of such equipment and facilities requires the services of a skilled, well trained and loyal force with a primary interest in safeguarding employees and the public so that injuries and accidents due to man-failure, with their consequent costly disabilities, may be avoided. Machines can be acquired today with what we term a certain output, but it is much harder to obtain an employee and be assured of a normal output at all times or at least until he is well trained. Now, more than ever, it is essential to conserve and streamline human effort by maintaining the efficient health of the employee and in this way rule out the employee who is a hazard to himself, his fellow workers or the public and this can best be accomplished through the medium of a physical examination in the same sense that supervisors of equipment feel an inspection is necessary at certain intervals.

• • •

The first measures of safety in any accident is prevention, consequently the function of industrial health today has changed considerably in any well organized industrial health unit and may be classified as remedial and preventive. The remedial consists in the treatment of occupational injuries and diseases. The preventive consists in the proper placement of the employee through the pre-employment examination; follow-up by periodic examinations depending upon the hazard of the occupation; and finally, proper supervision of the employee who feels that he must come to work if he is ill with ordinary illness. Many problems arise from diseases peculiar to certain occupations and with present industrial expansion the development of new hazards is to be anticipated. Speaking of the electric industry, Mr. N. M. Argabrite, vice-president, American Gas and Electric Company, has said:

"There are men today climbing poles who have absolutely no business to ever go up a pole because of some physical defect of which they, themselves, may not even be aware. There are men today driving cars and trucks who are not qualified to drive cars and trucks perhaps on account of eyesight, perhaps on account of some nervous affliction or for other causes. These men must be relocated and be placed where they will fit or, if necessary, be removed."

Industry today must be concerned with such problems as these:

When is a man safe with Tuberculosis?
When is a man safe with Syphilis?
When is a man safe with High Blood Pressure?
When is a man safe with Defective Vision?
When is a man safe with some Nervous Condition, and finally when is a man safe with an *abnormal heart condition?*

Great strides have been made in meeting the problem of tuberculosis in industrial workers, since the disease in 1911 was first on the mortality list, but today it is now in sixth place. From an economic standpoint it cost the Eastman Kodak Company $10,000 to carry out X-Ray and other studies to rule out tuberculosis of all their employees . . . on the other hand it costs a community on the average about $3,000 to treat one case.

• • •

A great amount of effort has been made to prevent blindness in infancy, yet after infancy too little attention is directed to visual acuity until the young man presents himself to industry and even then many industries neglect visual efficiency. In your own industry, for example, color perception is important in matching wire cords in any complex electrical setups as in a power house. We know, for example, that about 4 per cent of the population are definitely color-blind, but there are about 20 per cent who have poor color discrimination and as they grow older lose their ability to discriminate accurately, therefore, periodic check-ups are essential even after a pre-employment examination.

The need for perception in distances varies with the type of job, for example, a truck driver must have good distant vision as well as be free from glare blindness if he is driving at night, while the office worker should have good near

vision. Again visual activity is affected with age, because the average employee at 35 years of age begins to have inability to focus right. What good does it do for a committee to check up on unsafe working practices and report every month or so if you have an employee who because of hardening of the arteries of the brain with a consequent high blood pressure becomes confused when an emergency arises and does the wrong thing endangering the lives of his fellow workers.

• • •

Industry is very much concerned with this problem of conserving manpower by placing the man where he is most fit. Most large industries are able to afford some protective measure because each has today an industrial health unit under the direct supervision of a medical director who usually works in conjunction with the members of the personnel or safety department in an attempt to study their problems. The objective which personnel managers, safety directors, industrial engineers, health officials, physicians or any others concerned are attempting is essentially an idealistic one. The conception of better health for all with consequent economic, social and spiritual advantages as well as the safety factor demands idealism, but it must also be a practical movement in order to withstand the criticism of those who might feel that these ideals are reactionary measures forced upon an employee by his own industry, or an attempt to be discriminatory to any particular group.

Industry is not the only one concerned, because our experience has been that if an employee has a suspected case of tuberculosis or syphilis, for instance, his fellow employees are usually the ones who complain that the afflicted man is a hazard, and that they are fearful of working with him. This indicates that the employees themselves are vitally interested in this question of industrial health.

Two great problems of any industrial health program, particularly if employees are spread over a wide area, are how to reach the groups for whom preventive measures are necessary and how to insure they will be most effective. It is of course most desirable that employees have knowledge of the advantages of preemployment and periodic physical examination with a follow-up by the family physician.

• • •

Briefly, health education may be best accomplished by informing the employee or the public upon matters of health and by so interesting and motivating them with the results of our labors there will be a change in conduct toward an ideal which we hope to attain. This may be accomplished by posters, bulletins, magazines, conferences in group, motion pictures, radio or health clinics as is being done in several large industries today.

However, the object of such educational effort is not only to inform, but to influence an individual. It does no good for an individual to know that he might have an abnormal heart condition if he is not influenced by his family physician to conserve his energy by changing his habits of living or work so that he will not be a hazard to himself or his fellow-employees. The average individual, being human, has a tendency to change back to old habits as soon as he begins to feel well. Therefore, the periodic physical examination is a constant reminder or check-rein on him.

Some industries term the pre-employment examination a placement examination, because the idea behind these examinations is not to reject those with physical defects, but to place men at work for which they are physically fit. Those who are rejected are turned down simply because their particular defect makes them a hazard, therefore unsafe in that particular type of employment either to themselves, their fellow-employees or to the general public. It must be remembered that there are few of us who are perfect human specimens, and industry must of necessity accept its share of less than perfect applicants and teach them to become perfectly useful employees, or permit them to correct their defects, if remedial, so that they can become safe employees.

• • •

In setting up a program to make health education effective in a positive way and still incorporate the ideals mentioned before we feel that our own organization has accomplished a great measure of success by maintaining the person-to-person relationship with the employee and his family physician. A review of our own practice may be of interest.

Since our system extends over a vast area we do not have full time men, therefore, like most small industries our examinations must be made by competent medical men located anywhere along our right of way. The report of the examination is sent to our office and on review of this report the applicant is accepted or rejected. If he has a minor defect we may qualify him temporarily and send a letter to him notifying him about his defect and asking that he place himself under the care of his family physician. To be sure that he does this, we request some type of answer from the physician whom he has consulted.

An example of how this matter is handled may be best explained by Case No. 1:

An applicant, age 33, was examined on Sept. 19th, 1941, and the following noted on his examination: Defective vision, slight hypertension and defective teeth.

The following personal letter was sent to him at his place of occupation:

I am in receipt of your recent physical examination report, which shows that your vision is defective, your blood-pressure is above normal, and your teeth need attention.

The examination of employees is primarily intended to prolong life and usefulness, and to protect your own personal welfare. Will you, therefore, at your own expense, consult your family physician in order to correct your defects?

We are qualifying you temporarily, but if we do not receive a letter from your physician it may be necessary for you to undergo another examination, and we may have to disqualify you for all services unless you have these defects corrected. Therefore, in order to save you any inconvenience or hardships, kindly attend to this matter, and be sure to have your physician advise me when you have done so.

In answer to this letter his family physician wrote the following to me. This will show that not only is the employee interested in his own personal hygiene, but at the same time is grateful for our interests:

This note is to inform you that your employee, Mr. ————, has placed himself under my care. Preliminary examination reveals:

1st Moderate overweight;
2nd Slightly elevated blood-pressure 140/88;
3rd Several carious teeth;
4th Vision 20/20 in the left eye and 30/20 in the right eye, and
5th Laboratory work is in progress.

The patient has been referred to Doctor ———— for dental care and is to have his eyes refracted. He has been advised as to general hygiene, has been placed on a diet and further therapy will await the outcome of laboratory results.

Your interest in Mr. ———— is deeply appreciated by both me and the patient.

In case an applicant employee has a major defect which is remedial, if he is sufficiently interested he is notified regarding it and told that if he has it corrected we may be able to qualify him. This is illustrated by Case 2.

An applicant, age 33, was examined January 17th, 1941, at which time it was found that he had a right inguinal hernia. On February 10th, I received a letter from him saying that he had been notified that he did not pass the required physical examination and asking why. We sent him a letter giving the reason for his disqualification. Aug. 20th, 1941, he was again examined. The hernia had been repaired on June 10th, 1941. The

herniorraphy had firm union, and following the receipt of this report the man was qualified.

In many cases we have found that this was the first examination these men had undergone. They had thought themselves to be in perfect health and were thankful that the defect was discovered. This matter of sending them a letter is more productive of good results than merely telling the applicant he has a defect and taking a chance that he will present himself to his physician. He has to present his letter to his physician, and it is not necessary for the physician to do any guess work as to his defects. In this way also he retains that personal contact with the family physician in whom he has utmost confidence, and he learns that the particular industry is anxious to accept him if he is a good physical risk and not a hazard. It gives an opportunity for the physician to explain how important it is to be in good health, for himself, his family and the industry he represents.

• • •

Doctor Parran stated recently it is wasteful for industry to train a highly skilled employee over long months only to have him break down suddenly with tuberculosis, mental disease or some crippling condition. Therefore, the periodic examination at stated intervals or examinations made at the request of the employee or his supervisory officer are likewise of great value, in that they contribute to the health and efficiency of workers in several ways.

1st. Employees exposed to hazardous conditions due to their type of work may contract some occupational disease or due to an aging process develop a condition which makes them unsafe to the public, themselves or their fellow employees.

2nd. Employees showing evidence of occupational disease can thus be removed from exposure and appropriately treated and at the same time necessary steps made to control the occupational hazard.

Inclusion of the executive personnel is beneficial from two standpoints:

1st. We are prolonging the life and efficiency of men who are hard to replace.

2nd. It has the psychological effect of selling the benefits of the examination to the other employees. Therefore, it aids in proving that the measure is not discriminatory.

It should be emphasized that the records of the physical examination must be a matter of strict confidence between the members of the medical department and where possible the records should be kept in the doctor's office, preferably in the office of the medical director who is made responsible for the acceptance or rejection of an employee.

This serves several purposes:

1st. Because he has a more thorough knowledge of the type of work the employee is to do the doctor can more readily evaluate the employee's physical condition;

2nd. It prevents a great deal of embarrassment to the examining physician in his own community if he is able to say that he has nothing to do with the qualification of the employee, but is merely acting as an examiner and in this way assures a true picture of the employee's physical condition; and finally all that is necessary for the supervisory officer to know is whether the employee is safe for his particular type of work.

The examination must also be compulsory. Human nature being what it is, the average person hesitates to go to a physician either because of the fear that he may find something wrong and bar him from his position, or because he may feel that he is not able from a financial standpoint to pay the physician for the necessary examination.

These are precisely the ideals followed in our methods of carrying on the periodic physical examination. The routine is as follows:

The examination is carried out by one of our examining surgeons along the nearest terminal point. The history form contains direct questions regarding any illnesses, injuries or operations. The physical examination proper covers all systems of the body. In this way most of the chronic illnesses are detected that rank high as the causes of death among industrial workers. Unfortunately this type of examination does not always exclude some conditions which may produce sudden death, for example: such as may happen in coronary heart disease, and for this reason some people are apt to frown upon the results of these examinations, but these are rare conditions.

In an effort to avoid this type of emergency after the report of the employee's examination is reviewed in our office a letter is sent to the employee even on the slightest defect.

If his condition warrants it we may request an examination more frequently. An example of our follow up is seen in Case 3. Upon receipt of his examination in July, 1941, the following letter was sent:

I am in receipt of your recent physical examination report, which shows your blood-pressure is above normal. The periodic examination of employees is intended primarily to prolong life and usefulness and to protect your personal welfare. Will you, therefore, kindly co-operate by consulting one of the doctors of the Hospital Association in order to help you correct this condition? You may, if you prefer, consult your family physician, at your own expense, for the necessary advice in this matter, having him advise me when you have done so.

Your co-operation will be greatly appreciated.

Upon receipt of this letter the employee went to his family physician, who sent the following letter to me to show that the employee was under his care:

Mr. ———— consulted me on July 25th, 1941, relative to your letter of July 10th stating that his blood-pressure was above normal. His history has listed no positive symptoms. Physical examination showed blood pressure 160/98. The apex of the heart was at the nipple line in the fifth interspace. There were no murmurs, the heart tones were good, and the rate was regular. There was no evidence of cardiac pathology. Apparently his diastolic pressure was the most important problem and I discussed this with him. I found that his routine of living was very irregular, that is, when he worked at night he slept only two or three hours a day, and was very irregular as regards his meals. He was advised to take adequate rest, proper dietary measures, avoiding salt as much as possible and equal parts of sodium sulphocyanate with phenobarbital was prescribed in doses of one teaspoonful after meals. He was also advised to cut down on the number of cigarettes, which usually amounted to forty daily.

• • •

Since industrial hygiene is not limited to the prevention of occupational diseases, but also seeks to promote the health and prolong life of the worker, we are attempting to educate the employee to realize that good health is an economic investment to himself. For instance, the man in poor physical condition is not likely to do good work and therefore fails to merit promotion, either because he does not get along with other employees or because he is indifferent, temperamental, tactless or dissatisfied. It is difficult to evaluate the effectiveness of any program of health education, because we have no measuring stick, as it were, to note our progress in the matter of efficiency or benefits accruing to the individual. However, in the middle years of life modifications in our mode of living and working are exacted by the laws of nature. But being human beings, most of us believe that nature will not take its toll on us, and we all carry on with increasing activity until some vital structure fails, leaving some of us invalided if we are left to our own. Nature has endowed us with a physical reserve which enables us to carry on in the presence of the early stages of disease. For this reason defects have not been discovered until they have advanced beyond the possibilities of relief, in this way producing man failure possibly at a critical moment.

The periodic physical examinations are primarily for the purpose of discovering these defects in the early stages, when there is a possibility of cure or amelioration of the condition so that the progress of any degenerative condition is delayed

and the safety factor is thus augmented as well and the economic activity of the individual prolonged.

Employees returning to work after absence because of illness or injuries or after prolonged absence for any reason should be subject to examination in accordance with the plan acceptable to the medical department. There are many objections made to the necessity for this type of examination, but I think the following cases will illustrate that not only is it a necessity, but a distinct benefit to the employee.

Case 4: In December, 1939, we were asked to make an examination of a conductor, age 51, who had been employed for about thirty years.

Investigation disclosed that he had injured his shoulder in 1937 and since that time it had become dislocated on three different occasions. He described his first dislocation in an attempt to board a moving locomotive at the gangway step. The locomotive was moving not more than three miles per hour. As he swung on the shoulder came out of place. He wore an elastic shoulder body support after the first dislocation, but it began chafing and cutting him so that he slit it open part way to relieve the pressure and in so doing apparently destroyed any benefit that might have been expected from the support, as the last time the shoulder was dislocated he was wearing the support. The last time his shoulder was dislocated he explained that the train he was working on had stopped. In lining a knuckle preparatory to making the coupling between the engine and the caboose, the shoulder came out. This man was examined bv an orthopedist and he underwent an operation which had been recommended in April, 1940. Following the operation Doctor J. W. ———, who performed it, recommended that the man be permitted to return to work. We qualified the man with the understanding that he be re-examined within a period of three months. Since that time he has undergone an examination every six months without any further history of injury and is being kept under observation.

Case 5: Car man helper, age 24, with five years of service, was referred to the office for an examination in December, 1940, following an injury. The following history was obtained:

He stated that on June 1st, 1940, his car was sideswiped by a truck and his arm, which was lying on the door, was caught and broken. He was taken to the hospital, where his injury was treated, and at the time of our examination a marked deformity of the left arm was disclosed. He was referred to an orthopedist, who suggested that a further operation upon the arm would be beneficial and the man should be urged to have this done. In April, 1941, several months after the operation, we were informed that this man's arm had improved to the extent that he could be considered qualified to return to work. The physician further recommended that another operation be performed in a few months in order to restore the arm to 100% efficiency. Just recently inquiry was made as to how this employee was getting along in his work and we were informed that the man has been working steadily since May, 1941, and the arm has not hindered him from doing his work satisfactorily.

* * * *

It is our intention to follow this case up to see that he gets complete benefit from any further operation.

These are merely a few examples among thousands of such cases in which we have similar records. Because of such experience we feel that our methods have been a most effective means of industrial health education, conserving of manpower.

To reiterate:

1st. The pre-employment or placement examination is useful in determining the physical fitness of applicants for employment; in permitting the proper placement in the organization of defective workers or placing such defective cases under proper remedial measures so as to make them fit and thereby helping to prevent man-failure.

2nd. The periodic physical examination is beneficial in the supervision of older workers exposed to hazardous conditions and in measuring the progress of efforts to control occupational diseases as well as discovering physical defects when corrections may still be effective.

We have merely scratched the surface of this tremendous problem of conserving the manpower of our industrial army. Nevertheless it is the beginning of an idealistic humanitarian effort to think of this industrial set-up not as an aggregate of machines and buildings, but as a virile army of men and women working together to provide an essential service in a common cause. The efficient operation of skilled, well trained, loyal employees will help to prevent injuries and accidents with their consequent costly disabilities through the failure of manpower in this streamline age. Also, this type of program is practical in that it seeks the source of non-occupational or ordinary illnesses and in this way help to decrease them, and it in turn promotes the health and prolongs the life of the worker by educating him to realize that good health is an excellent economic investment.

Conference on Reclamation and Scrap Salvage Held at Philadelphia

FURTHER advances in coordinating reclamation and salvage activities of electric operating companies as an important part of war conservation measures were made at a conference at Philadelphia, Feb. 4, held under the auspices of the EEI Committee on Purchasing, Stores and Transportation. W. P. McArdle, Chairman of the Committee presided.

Most of those taking part in the Conference were representatives of Eastern utilities since this was the first of a series of regional meetings to be held by the EEI. The next is scheduled for St. Louis in March. The War Production Board was represented by George Sutherland, Utility Coordinator in the Industrial Salvage Section of the Bureau of Industrial Conservation of the Board, who plans to attend future meetings and will cooperate closely with the utilities.

Mr. Sutherland stressed the urgent need of scrap material such as copper, lead, zinc, iron and steel, rags and paper. All companies are asked to make a thorough and prompt inspection of not only materials and supplies stocks but all inactive or out-moded equipment and apparatus to see what items can be converted into scrap. He also pointed out the importance of all possible re-use of materials thereby reducing the demands on the manufacturer or fabricator for new materials.

The importance of scrap salvaging is indicated by the fact that the Industrial Salvage Section estimated that scrap contributed about one-half of the steel, more than one-third the copper, almost one-third of the zinc, nearly one-fourth the aluminum, one-fifth the lead and one-sixth of the rubber used in 1941 production. The need for scrap to augment the supply of these materials in 1942 is urgent and the Salvage Section is urging that utilities do all they can to help fill this need.

Mr. Sutherland suggested that each company become thoroughly acquainted with W.P.B. Order M-24. The gist of this order is that scrap producers who accumulate 50 tons or more of scrap metals must report this to W.P.B. Mr. Sutherland also indicated that an order may soon be issued which in effect will say that utilities must not accumulate more than a certain amount of scrap copper in any 30-day period (the amount is not yet designated).

Papers presented by utility company representatives setting forth their present practices with respect to salvage and reclamation methods and disposal of scrap included the following:

Salvage and Reclamation of Materials and Disposal of Scrap. By E. S. Brock, Public Service Electric and Gas Co., Newark, N. J.

Salvaging of Materials. By F. R. Schaffer, Pennsylvania Power and Light Co., Allentown, Penna.

Salvage and Reclamation Methods and How They Are Being Solved. By C. H. zur Nieden, Philadelphia Electric Co., Philadelphia, Pa.

Salvage and Reclamation Work in Electric Utilities. By K. C. Campbell, Detroit Edison Co., Detroit, Mich.

A general discussion followed and there was a frank exchange of ideas and methods.

Papers and discussions at the Conference have been reproduced and are available from the Edison Electric Institute.

Eighteen Receive Edison Electric Institute Medals

By Mae B. Woods

Secretary, Committee of Judges, Edison Electric Institute Medal

IN 1934 the Edison Electric Institute Medal was made available for award for cases of successful resuscitation from electrical shock by manual means, by employees of utility companies. To date 121 Medals have been awarded; eighteen during the past 12 months.

In reviewing the applications for the award, one is impressed by the courage, resourcefulness and skill of the employees, in rescuing the injured and promptly applying their training in artificial respiration to saving the life that but for their action, would have been lost. This fact is all the more impressive when it is realized that all that is needed is a pair of hands, directed by a trained brain.

The men and their companies are to be sincerely congratulated in carrying their training to such a successful conclusion. The last year has brought forward further cases and the details of these are presented by the Committee of Judges: Mr. H. J. Burton, Mr. W. R. Smith, Miss Mae B. Woods, Secretary, and Mr. Wills Maclachlan, Chairman.

* * *

No more fitting tribute was ever paid to all of the men of the light and power companies past and present who have given of their knowledge and skill to save the lives of their fellow workers—ofttimes at great personal risk to themselves—than was done in a letter to the Houston Lighting and Power Company of Houston, Texas, in connection with the resuscitation of R. E. Jacobson by the J. M. Loveless Line Crew. The sentiments expressed in this letter will be a source of pride and great satisfaction to every employee of every light and power company throughout the country:

Houston, Texas
October 23, 1939

The Houston Lighting & Power Co.
Houston, Texas
Gentlemen:

I am writing you concerning one of your men, Mr. R. E. Jacobson, who was almost electrocuted in our neighborhood. We, the neighbors, were in deep sadness and gloom hovered over our locality during the time that this young man was lying on the ground unconscious. We tried in our feeble way to do what we could with bedding and hot water bottles, etc. We notice in the newspapers that no credit was given to the men with whom he worked—they are the ones who saved him—before any other aid reached him. We feel that they deserve the praise, and as one person has said, "They deserve a Gold Medal." They worked and toiled—when one man would give out exhausted there would be another man waiting to force air into the lungs. They showed the true spirit of Americanism and love for a fellow-worker. We do not know the names of these men but we want them to know that we appreciate them, and our neighborhood will not soon forget them.

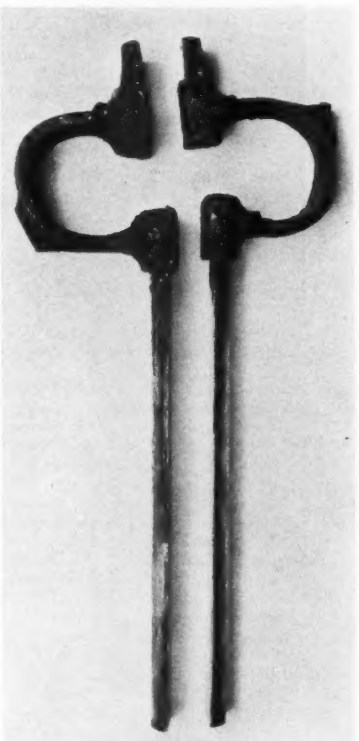
We would like also to tell you that while the men worked so hard, the ladies of our neighborhood would gather in small groups and pray and beg God to save this young man's life. We knew that he was some woman's husband and some Mother's son and that he was giving his life that we might have the comforts of electricity.

Too much praise cannot be given these men who toil day and night—through danger, that the masses of people may enjoy the comforts of life, they should be given the flowers while they live, after they are gone there are no eyes to behold their beauty. A kind word for their work and toil will cost so little but mean so much.

Our community desires that you pass a kind word to these men from us and tell them that we deeply appreciate them and the heroic spirit that they have manifested in our midst—and may God richly bless them and their loved ones is the prayer of our people.

Very sincerely,
(*Signed*) MRS. EDITH BAILEY
4311 Floyd Street

* * *



Copper that Edison Laid is Used in Edison Electric Institute Medal

A section of mains conductor, with insulation and pipe covering removed, and with sectional jumpers, from the original mains laid down in New York City in 1881 by the late Thomas Alva Edison. This copper, of historical and sentimental interest to the industry, was part of the first underground distribution systems in the world supplying current for electric light and power. It was installed under the personal supervision of Mr. Edison in the lower part of New York City and was known as the "Edison Tube System."

Employees of all electric light and power companies are eligible for the Edison Medal. A certificate describing the act of resuscitation, signed by the president of the Institute, is presented with each medal and a Certificate of Assistance is awarded those who have rendered valuable aid in resuscitation. Miniature medals and certificates are also given to members of line crews who have participated in cases of successful resuscitation.

The sentimental and historical value of the medals is enhanced by the inclusion of copper from the original two-wire system laid down in New York City in 1881 by the late Thomas A. Edison as part of the world's first underground system for the distribution of current for electric light and power.

The recipients of the medals awarded in 1941 and brief statements of the circumstances leading to their award follow:

C. WILLIAM MUEHLBERGER
Pennsylvania

While starting up a rotary converter in a company substation Asa C. Slough, substation operator of the Pennsylvania Power and Light Company, fell and struck his head on the cast-iron base of the machine. In attempting to get up Slough made contact with his head between the energized switch clip on the alternating current starting panel and a panel mounting bolt and was rendered unconscious.

C. William Muehlberger went to the substation after efforts to call Slough by telephone were unsuccessful and found Slough lying unconscious on the floor. Muehlberger moved Slough away from the energized equipment, hastily requested a telephone operator to summon an ambulance and medical assistance and then applied the Schafer Prone Pressure Method of artificial respiration. In about ten minutes Slough was breathing without assistance and upon arrival of the ambulance was taken to the hospital for treatment.

The Medal and Certificate were presented to Muehlberger on Tuesday, May 6, 1941, by Mr. N. G. Reinicker, Vice-President and General Manager of the Pennsylvania Power and Light Company at the 14th Annual Eastern Pennsylvania Safety Conference Dinner Meeting held in the Hotel Bethlehem, Bethlehem, Pa. The meeting was sponsored by the Lehigh Valley Safety Council and Cooperative Organizations and approximately 500 persons representing a large industrial and civic area were in attendance.

C. William Muehlberger, left, Safety Supervisor of the Pennsylvania Power and Light Co., receiving Edison Medal from N. G. Reinicker, Vice President and General Manager of the company.

Lloyd C. Fry accepting Certificate and Medal also from N. G. Reinicker.

BERNARD G. HEDLUND

Minnesota

On August 15, 1940, at 6:35 p.m., during a severe rain and lightning storm, Arthur W. Nelson of the Minnesota Power and Light Company completed the re-fusing of a distribution transformer and as he was preparing to descend the pole made contact with the 6600-v circuit. Nelson fell away from the contact and hung unconscious in his safety belt.

B. G. Hedlund, district superintendent, Sandstone District, had accompanied Nelson on the servicing job and was at the foot of the pole. Not having on spurs Hedlund went to a nearby farmhouse and procured an extension ladder from a Mr. B. R. Petersen who, with his son Floyd, assisted Hedlund in getting and placing the ladder against the pole. Hedlund climbed to the top rung of the ladder and holding on to the pole with his left arm he pushed Nelson's head forward with his own forehead and gave artificial respiration with the pole top method with his right arm. When his left arm became numb from the strain Hedlund requested that he be tied to the pole. This the Petersens did and Hedlund continued the artificial respiration. Lineman W. C. Olesen arrived on the scene after having received a telephone message that a power and light man had been shocked and was hanging from his belt from a pole. Olesen climbed the pole and noted that Hedlund and Nelson were tied to the pole. By the time he secured rope blocks and descended to put a line on Nelson preparatory to lowering him, Nelson was partly conscious. Nelson was lowered from the pole and put in the car of a doctor who had arrived.

At the annual Safety Meeting of the Minnesota Power and Light Company building in Duluth on Tuesday, February 18, 1941, the Medal and framed Certificate were presented to Mr. Hedlund by Mr. C. C. Boswell, Vice-President and Chief Engineer. There were 43 persons present, including Mr. Nelson.

J. M. LOVELESS' LINE CREW

Texas

During a severe rain storm on October 20, 1939, a line crew of the Houston Lighting and Power Company went with the foreman, J. M. Loveless, to an assigned address to

BERNARD G. HEDLUND
Minnesota Power and Light Company

change a burned out transformer and restore service. When the crew reached the pole on which the work was to be done, Lineman G. C. Fairfield ascended the pole with a handline and R. E. Jacobson followed him and stopped at a point below the transformer and in proper position. He then proceeded to assist Fairfield by passing up the rubber goods which Fairfield placed on the 2300-volt primary connections. As Foreman Loveless looked toward Jacobson he noticed that he suddenly became tense and smoke was coming from one of his gloves at a point where he was holding a 4000-volt primary lead to the transformer. It was later shown that Jacobson did not have on rubber gloves but only leather ones. Foreman Loveless called to Fairfield who immediately cut both primary leads feeding the transformer and Jacobson slumped unconscious in his belt. Fairfield passed the handline around Jacobson and the latter was lowered to the ground and artificial respiration was begun by the prone pressure method. Resuscitation was continued for about forty minutes before there were signs of recovery. After five minutes more of resuscitation Jacobson breathed without assistance. Artificial respiration was performed by the entire crew, changes being made at five-minute intervals. Jacobson was placed in the care of a doctor who had arrived with an ambulance and was taken to the hospital.

The Medals and Certificates were presented to the J. M. Loveless Line Crew on Monday, December 22, 1941, the members consisting of Messrs. G. C. Fairfield, P. L. Dodson, E. A. Stahl, E. H. Mosley, T. Plumlee, L. J. Walston, L. J. Harwell, C. T. Moore and H. C. Sauer.

LLOYD C. FRY

Pennsylvania

As he was completing the re-tying of a phase wire to the insulator after installing an armor rod on the conductor of a 4000-v single-phase circuit, Claude Choplin, first class lineman, Pennsylvania Power and Light Company, fell across the phase wire on which he was working when his right climber spur cut out. As he fell, his left leg made contact with a grounded guy wire. Choplin was rendered unconscious. Lloyd C. Fry, first class lineman, was working with Choplin. He immediately tried to push Choplin clear but being unable to do so took hold of Choplin's rubber gloves and pulled him off the wire. Choplin fell backward in his body belt. Fry quickly got into position and began artificial respiration by the pole top method. Choplin regained consciousness in approximately three minutes and although he said he felt all right, Fry would not permit him to climb down but with the assistance of Louis J. Welshans, a handline was employed to lower Choplin to the ground. Foreman Mark D. Fegley and Welshans then took Choplin in a car to the doctor.

The Medal and Certificate were presented to Mr. Fry by Mr. N. G. Reinicker, Vice-President and General Manager of the Pennsylvania Power and Light Company, Wednesday, June 11, 1941, at a noon luncheon meeting of the Pottsville Rotary Club at the Necho Allen Hotel, Pottsville, Pa. Approximately 150 persons, representing guests, employees and Rotarians were in attendance.

LLOYD C. MONTAGUE

Oklahoma

On August 12, 1940, at 11 a.m., Lineman Mack R. Heiserman of the Oklahoma Gas and Electric Company was working with other members of a line crew, under Foreman Steve Hughes, on a job of rearranging a two-wire, 120-v secondary circuit into a three-wire, 120-240-v system.

As Heiserman worked on a pole reconnecting the services he made contact between one of the phase wires and the bare neutral receiving a 120-volt shock. He fell clear of the circuit and hung in his safety belt. Lloyd

W. W. WHITT
Alabama Power Company

C. Montague was working on the next pole and when he heard a woman calling looked around and saw Heiserman's condition. Montague and lineman Earl Younger climbed the pole on which Heiserman was hanging and Montague immediately started artificial respiration by the pole top method. Younger arranged a handline and held Heiserman's head in a proper position to facilitate breathing. In about two minutes Heiserman began to breathe naturally and was lowered to the ground, Montague backing down the pole and administering artificial respiration on the way down. On the arrival of an ambulance Heiserman was taken to a doctor.

The Medal was presented to Mr. Montague on February 21, 1941, by Mr. J. F. Owens, President of the Oklahoma Gas and Electric Company, at the annual Memorial Meeting of the employees and their families. This Memorial Meeting is an annual affair for the purpose of honoring those who have passed away during the year; for awarding service pins; and for honoring those who may have saved life or performed some other outstanding acts. The meeting was very impressive and had an attendance of more than 1500 persons. It was held in the Oklahoma City Municipal Auditorium.

W. W. WHITT
Alabama

During the afternoon of December 6, 1940, William L. Woodard, repairman in the Haleyville District of the Alabama Power Company, was working with W. W. Whitt, Local Manager at Haleyville, in supplying service to a church. After the service wires had been strung, Woodard energized the transformer from the 12-kv supply circuit using a stick for reclosing the fuses. The stick for this purpose was handed to Woodard by groundman Vernon O'Rear. Woodard unfastened his safety strap and was about to descend from the transformer structure when his right hand and arm made contact with a transformer primary lead. The fuse blew out and Woodard fell to the ground.

Mr. Whitt was walking across the highway away from the transformer structure to check a customer's motor when he heard the arc and looking around saw Woodard fall. Whitt immediately started artificial respiration and Vernon O'Rear assisted by rubbing the patient's arm. After approximately five minutes Woodard regained consciousness. Because of his difficulty in breathing artificial respiration was continued for approximately three minutes longer. Woodard was breathing freely then and artificial respiration was stopped and efforts made to reassure Woodard as to his condition. A doctor was summoned and took charge of the case and Woodard was subsequently taken to a hospital.

The Edison Medal was presented to Mr. Whitt by Vice-President E. W. Robinson on August 8, 1941.

C. C. POYNER
Georgia

On November 9, 1939, a line crew of the Georgia Power Company under the supervision of L. P. Moore, foreman, had been employed all day in changing taps on 11-kv transformers. Having changed tap in the second transformer, one similar unit having been completed, Leo F. West and C. C. Poyner, lineman, replaced the cover on the transformer and were in the act of moving around the pole to get in position to close the fused cut outs. West was somewhat higher on the pole than Poyner and as West moved he touched the energized part of the fused cutout with his head. Poyner heard the arc and as he looked up West's spurs cut out and he hung suspended by his safety belt. Foreman Moore called to Poyner to start working on West and sent helper Hugh Phillips for assistance. When West fell his safety strap fouled Poyner's but quickly freeing himself Poyner took position under West and supporting his body with his knee started artificial respiration by the pole top method. West's body was rigid and his stomach hard when Poyner started working but soon relaxed after artificial respiration was begun. In two to three minutes West breathed lightly until consciousness returned. Foreman Moore climbed the pole and assisted in lowering West to the ground. Later an ambulance arrived and West was taken to a hospital.

The presentation of the Edison Medal and Certificate to Mr. Poyner was made by Mr. E. W. Mitchell, Vice-President and General Manager of the Georgia Power Company in Columbus, Ga., on July 11, 1941, as a special feature of a safety meeting of the Columbus Division supervisory pensonnel. All employees of the Columbus Division were also present when Mr. Poyner received his Medal. The number in attendance was approximately 200, including a number of Company officials from the general office and other divisions.

EDWARD C. NAUGHTON
Montana

Edward C. Naughton, line foreman, C. A. Farrell, lineman, and Ira Tuck, groundman, all of the Helena Division of the Montana Power Company, were working together on July 10, 1939, making repairs to the distribution system owned by the State of Montana. Naughton and Farrell were on the same pole and Farrell was kneeling on the top of a 37½-kva transformer replacing the grounded tap to the neutral of the secondary service. Naughton was working on a connection to another transformer and was informed that Farrell was in trouble by groundman Tuck. Farrell in kneeling down had let his foot come in contact with an uncovered 4160-volt primary lead between the cutout and the transformer and contact had been made at the brass shoe eyelets. Naughton did not know how Farrell was caught so he pulled both cutouts and cut all primary risers. Farrell slumped down and hung in his safety strap. Naughton started artificial respiration by the pole top method immediately and

Left to right: W. E. Mitchell, Vice President and General Manager of the Georgia Power Company, Leo F. West (resuscitated lineman) and C. C. Poyner.

after about five minutes Farrell showed signs of recovery and approximately two minutes later was breathing without assistance. On the arrival of a doctor Farrell was taken to his home and then on to the hospital.

The Edison Medal was presented to Mr. Naughton by Mr. Carl Jordan, Assistant General Manager of the Montana Power Company at the Company's annual first aid meet held in the Great Falls Civic Center, Great Falls, Montana, on June 29, 1941. Approximately 300 witnessed the presentation and contest among whom were all plant, line and shop foremen whose duties made attendance possible together with many prominent company officials and guests from the nearby plant of the Anaconda Copper Company. Mr. T. J. Rigby, Safety Director of the power company, presided. Following the ceremonies a picnic luncheon was served in the Rainbow Room of the Rainbow Hotel.

Carl Jordan, Assistant General Superintendent, The Montana Power Co., pins an Edison Medal on Edward C. Naughton, while T. J. Rigby, Safety Director, and C. T. Booker, Great Falls Division Manager, look on.

VICTOR LEON JEWETT

Idaho

Ralph A. Nicholas, serviceman of the Idaho Power Company, climbed a thirty-five foot pole on which was a single-phase distribution transformer fed from an 11-kv single-phase primary circuit. Nicholas proceeded to prepare the transformer for replacement. The pickup truck was backed up to the base of the pole and V. L. Jewett, local agent who was in charge of the work, was at the base of the pole changing taps on a new transformer which was to replace the one on the pole. He had observed Nicholas take correct position, couple his safety belt and pull the fused cutout. Nicholas then opened the secondary connections and as he climbed up higher on the front or hot side of the pole he made contact at the base of his neck with some part of the still alive connection. He fell from the pole, fortunately landing on a hot line tool stick in the truck which bent allowing him to slide from the truck and roll to the ground, still unconscious but without broken bones.

Jewett started artificial respiration by the prone pressure method in approximately one minute and after three minutes Nicholas showed signs of recovery and soon was breathing without assistance. Nicholas was taken in a car to the office of a doctor and then on the doctor's advice to a hospital.

The Edison Medal was presented to Mr. Jewett by Mr. C. J. Strike, President of the Idaho Power Company, at a meeting of foremen on November 6, 1941, in the Company's building at Pocatello, Idaho.

J. E. SPILLERS' LINE CREW

Oklahoma

A line crew of the Oklahoma Gas and Electric Company, under Foreman J. E. Spillers, was working at Drummond on the morning of May 28, 1941, extending a 7200-v single-phase grounded-neutral primary line and which necessitated some rearrangement of conductors and removal of crossarms. Lineman M. R. Heiserman was on the pole at which it was necessary to cut certain wires. One wire on this pole was known to be alive at 12.5-kv and this was cut by Heiserman using hot-line cutters, which he then sent down by hand line to groundman Joe S. Barnett. The primary neutral on this pole was to be removed so Heiserman took position on the pole to cut the wire with his pliers which appeared to be connected to the neutral side of the transformer one span away and which he considered to be dead. Heiserman put his left hand on the crossarm and took hold of the wire with his right hand. He immediately stiffened holding on to the wire with his left leg extending out away from the pole.

Groundman Barnett realized at once that Heiserman must be freed from contact with the circuit as quickly as possible. Throwing some slack in the hand line he then threw it over Heiserman's left leg and jerked down on it. Heiserman was pulled loose immediately and this quick thinking on Barnett's part made possible the ultimate saving of Heiserman's life by the whole crew working together. On a call from Foreman Spillers, E. O. Srader, lineman, descended the adjacent pole on which he was working and went to Heiserman's aid. He started artificial respiration by the pole top method and then Foreman Spillers, as soon as he could, put on spurs, climbed the pole and assisted by removing Heiserman's spurs. Heiserman was then transferred to Spillers' safety belt and with a hand line on Heiserman, Spillers took him down on his belt, Srader assisting in the giving of artificial respiration all the way. Heiserman showed signs of recovery after about one to two minutes and was breathing before he was lowered, but resuscitation was continued by the prone pressure method on the ground until the doctor arrived. Groundman A. Harris assisted in giving artificial respiration and truck driver Clarence B. Holloway rendered other necessary assistance and made the calls for doctor and ambulance. Heiserman was treated by the doctor and given a sedative as he was struggling violently.

On the evening of February 18, 1942, the dramatic story of how Mr. Spillers and his line crew saved the life of Mr. Heiserman by pole top resuscitation was reviewed as the line crew received medals and certificates from the Edison Electric Institute and awards from their own company, presented by their President, George Ade Davis. Two thousand five hundred people attended the ceremony held at the Shrine Auditorium, Oklahoma City.

Frank D. Cannon's Line Crew of the Philadelphia Electric Co. Left to right: Richard Lees, Frank D. Cannon, H. B. Bryans, Executive Vice President of the company, Harry L. Bauer, Stewart L. Brion and Frederick W. Grams.

FRANK D. CANNON'S LINE CREW

Pennsylvania

On April 30, 1941, Orville Beers, first class lineman, Philadelphia Electric Company, was working on a transformer pole carrying 2400-kv primaries and 110-220-v secondary circuits. He was completing the splicing of a transformer secondary tap to the secondary span wire when he displaced in some way the rubber protective equipment on a nearby primary wire and his right shoulder came in contact with the 2400-v lead. His right thigh was against the 110-v circuit. Beers

Alden H. Smathers Line Crew of the Philadelphia Electric Company. Left to right: Thomas J. Starkey, Jr., James H. Rogers, H. B. Bryans, Executive Vice President of the company, Alden H. Smathers and William H. Way.

fell away from the circuit and hung by his safety belt. Foreman Frank D. Cannon was standing about 30 feet away and, hearing a buzzing sound, looked up and saw Beers hanging clear. Cannon called to lineman Harry L. Bauer, who was nearby, to go to Beers' aid and told him to pull the fuse box. This Bauer did as he climbed past it and he then got into position and gave artificial respiration to Beers by the pole top method. Stewart Brion had just descended with Bauer from the same pole on which Beers was working and Brion had taken off his climbers. Quickly putting them back on and getting his belt and rubber gloves he went to help Bauer. When he reached Beers he was mumbling and there were signs of recovery. Bauer relieved Brion and after about five minutes of resuscitation Beers was breathing freely. Lineman Richard Lees took up the line by which Beers was lowered (and soon afterward a passing motorist took Beers to the hospital). Truckdriver Frederick W. Crams notified company headquarters and rendered other assistance.

Presentation of the Medal, in the name of the Line Crew, was made to Mr. Bauer by Executive Vice-President H. B. Bryans on Nov. 24, 1941, in his office in Philadelphia. Miniature replicas and certificates were awarded to the following members of the crew: Frank D. Cannon, foreman; Harry L. Bauer, lineman; Stewart L. Brion, lineman; Richard Lees, lineman, and Frederick W. Grams, truckman.

ALDEN H. SMATHERS' LINE CREW

Pennsylvania

On June 3, 1941, a line crew of the Philadelphia Electric Company, under Foreman Alden H. Smathers, was engaged in the rebuilding of a primary line on a customer's premises near Gum Tree, Pa. Thomas J. Morley, a transmission and distribution apprentice lineman, was removing an old through bolt from the pole. In some manner he made contact with a nearby single phase primary lead having a voltage of 2.3 kv to the ground. Contact was made at his right ear. Morley fell clear, hanging head down in his safety strap. James Homer Rogers, first class lineman, ran to the pole from about 150 feet away, climbed it and started artificial respiration by the pole top method. In about 2 minutes there were signs of recovery. Resuscitation was continued for about three minutes longer while preparations were made by Foreman Smathers to lower Morley and at about that time he was breathing freely. William Way, General Line Foreman and Thomas Starkey, Jr., truckdriver, assisted in lowering the injured man to the ground and in rendering first aid, treatment of burns and summoning medical assistance. When the doctor and ambulance arrived, Morley was taken to the hospital.

Mr. H. B. Bryans, Executive Vice-President of the Philadelphia Electric Company presented the Edison Medal and Certificate to Mr. Rogers for the Line Crew at a ceremony in his office in Philadelphia on Nov. 26, 1941. Miniature medals and certificates were presented to Foreman Alden H. Smathers, General Line Foreman William H. Way, Lineman James H. Rogers and Truck Driver Thomas J. Starkey, Jr.

WILLIAM O. HOLLIDAY, JR.'S LINE CREW

Louisiana

A line crew of the New Orleans Public Service, Inc., under Foreman William O. Holliday, Jr., was engaged on July 8, 1941, in transferring a 13.8-kv, three-phase circuit from an old to a new pole. Lineman A. H. Westbrook, M. A. Savoy and G. A. Groetsch were working together on the new pole and lineman U. I. Sander on the old pole. As Westbrook shifted his position on the pole the left foot gaff failed to engage the pole properly. He fell in his safety and his left shoulder made contact with the "C" phase conductor, the circuit being completed to his right spur in the pole. Savoy immediately grasped Westbrook's belt and pulled him clear of the circuit and Groetsch moved up from below and as Savoy and Sander assisted he placed Westbrook in his belt and started artificial respiration by the pole top method. Resuscitation was started in less than one minute and after about two minutes there were signs of recovery and very soon Westbrook was breathing without help. Savoy and Sander assisted Westbrook as he was lowered to the ground. In the meantime in accordance with the instructions of Foreman Holliday, lineman B. L. Banks and helpers T. D. Penton and J. M. Compton made preparations to give prone pressure resuscitation after Westbrook was lowered. Driver-helper R. L. Pritchett called the doctor and G. S. Breaux secured the first aid kit and applied emollient to Westbrook's burns and gave him ammonia to inhale. On arrival of the doctor, Westbrook was taken in a private automobile to the hospital.

On Nov. 11, 1941, before a gathering of 150 employees of the Company in the Distribution Garage in New Orleans, Mr. A. B. Paterson, President of the New Orleans Public Service, Inc., presented the Edison Medal and Certificate to the Line Crew. Miniature replicas and certificates were presented to each member of the Crew, as follows: William O. Holliday, Jr., Foreman; Linemen Mitchell A. Savoy, U. I. Sanders, G. A. Groetsch and B. L. Banks; Helpers, G. S. Breaux, J. M. Compton and Thomas D. Penton, and Driver-Helper R. L. Pritchett.

William O. Holliday Jr.'s Line Crew of the New Orleans Public Service, Inc.

Ralph H. Leister's Line Crew of the Philadelphia Electric Company. Left to right: William Stoll, Ralph H. Leister, H. B. Bryans, Executive Vice President of the company, Edward W. Meder and Howard Freas.

RALPH H. LEISTER'S LINE CREW

Pennsylvania

On Aug. 14, 1941, a line crew of the Philadelphia Electric Company, under Foreman Ralph H. Leister, was removing a pole near Mainland, Pa. The old pole had been removed and Foreman Leister had given instructions for the boom to be raised and the hoisting cable attached to the new pole, which was on the opposite side of a wire fence from where the truck stood. As the truck backed up, lineman Walter Richmond Grow started to cross the fence to attach the line to the pole. Foreman Leister was standing over the pole hole sighting for position of the pole and his back was to the truck. As he turned he realized that the boom was going to touch the overhead primary circuit and shouted to the driver. His voice could not be heard above the noise of the engine and the truck continued backing and the boom touched the conductor and the truck body touched the fence just as Grow climbed over the fence. The circuit was automatically deenergized at once but Grow was rendered unconscious by the shock. Lineman Edward W. Meder started artificial respiration by the prone pressure method at once and in about four minutes Grow showed signs of recovery. Resuscitation was continued for about ten minutes longer at which time the doctor who had arrived took charge of the case and removed Grow to the hospital. Foreman Leister, Truck Driver William Stoll and groundman Howard Freas assisted the efforts of resuscitation by rubbing the limbs of the injured and administering ammonia inhalant and other necessary first aid.

C. E. JORDAN
Appalachian Electric Power Company

The Edison Medal and Certificate were presented to the Line Crew by Executive Vice-President H. B. Bryans in his office on Dec. 2, 1941, and miniature replicas and certificates were also given to all members of the Crew, consisting of Messrs. Ralph H. Leister, Foreman; Edward Walter Meder, Lineman; William Stoll, Truckdriver and Howard Freas, Groundman.

C. E. JORDAN

Virginia

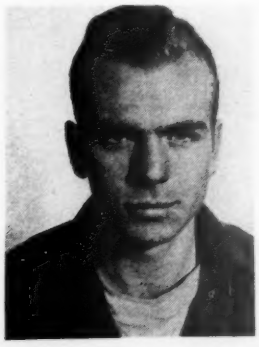
A line gang of the Appalachian Electric Power Company, E. C. Dunn, foreman, was transferring wires from old to new poles on July 23, 1941, in Lynchburg, Va. Linemen A. L. Ward and L. L. Crocker were working together and were on the old and new poles respectively. Foreman Dunn was at the foot of the next pole giving instructions to linemen P. H. Snead and C. E. Jordan. Ward was not within normal reach of circuit wires that were alive and did not have on rubber gloves. It is assumed that he cut out and in falling made contact with a 2300-v three-phase wire. Small burns were found on palm and thumb of his right hand. On the pole was a long gash which suggested a cut out. Foreman Dunn heard a sound as of someone calling and saw Ward fall backwards with both hands over his head. Ward slid down the pole head first, a distance of about ten feet, until his safety caught on a crossarm supporting fire alarm circuits. Crocker moved over immediately to give aid and as he turned Ward to an upright position, Jordan came up the pole under Ward and started artificial respiration by the pole top method. Snead also arrived at about the same time and assisted in supporting Ward and then arranged the hand line and fastened it to Ward's belt. In about five minutes Ward responded and was lowered to the ground where the prone pressure method was employed for a few moments. Ward had now fully regained consciousness. He was taken to the hospital as soon as the ambulance, summoned by Dunn arrived.

On Wednesday morning, Dec. 3, 1941, Mr. Jordan was awarded the Edison Medal and Certificate.

BALLARD F. WADE

Virginia

On July 25, 1941, Ballard F. Wade, a first class lineman of the Virginia Public Service Company, was working on a pole with line Foreman Garland C. Gum. Gum finished connecting up the secondary side of a transformer and started to climb up to the top of the pole to help tie in a 6900-v primary wire which Fred Earehart was pulling up with a rope for Wade. As Gum moved up, and apparently because of cutting out, his right shoulder touched the feeder beyond the rubber line hose protection and at the same time his left leg touched the secondary. Wade



HOWARD B. LITTERAL
Appalachian Electric Power Company

WILLIAM I. MARSHALL
Appalachian Electric Power Company

BALLARD F. WADE
Virginia Public Service Company

dropped down and around the pole, pulled Gum loose from the wire, got under him and as soon as Gum was in his safety belt started artificial respiration by the pole top method. Fred Earehart took a rope up the pole passed it over the crossarm and tied it to Gum's belt. Lyle Friel and Burrus Tanner, Acting Foreman, steadied it.

In a few minutes Gum responded and approximately four minutes later was breathing regularly. A ladder was gotten from the truck by C. E. Fitzgerald and he and Bogie Herron placed it against the pole. Gum wanted to climb down but Wade would not permit him to do this. With the rope around Gum's shoulder and over the crossarm and, with the assistance of Earehart and Herron, Wade brought Gum down. A doctor and an ambulance, which had been summoned by B. H. Tanner, were waiting and Gum was placed upon a stretcher and taken to the hospital.

The Edison Medal and Certificate, together with a President's Medal of the Virginia Public Service Company and a Resolution of the Board of Directors printed on parchment stock were presented to Lineman Wade by Mr. Howard L. Crumley, Vice-President, at a testimonial dinner in Wade's honor, held at the Hotel General Wayne in Waynesboro, Va., on Jan. 15, 1942. The dinner was for "Distinguished Service" and was attended by employees of the Company, members of the City Council and other City and County officials. Mayor A. R. Harding was one of the speakers. Raymond Hunt, Central Division Manager of the power company, was Master of Ceremonies.

HOWARD B. LITTERAL AND WILLIAM I. MARSHALL

Virginia

On Sept. 10, 1941, Alexander B. Davis, apprentice lineman of the Appalachian Electric Power Company, was working with other members of a transmission line crew on a jog of spot painting rusty members of a steel transmission tower and carrying 88-kv on the top arms and a 12-kv, four-wire circuit on a horizontal steel member at thirty feet from the ground. As Davis attempted to pass from one side of the tower to the other by way of the flat steel member supporting the 12-kv pin insulators, the upper part of his left leg touched a steel-member of the tower and his left foot made contact with the energized wire of the 12-kv circuit. Davis fell to the ground, a distance of approximately thirty feet. Howard B. Litteral, lineman, started artificial respiration at once and then because of Davis' condition, William I. Marshall, lineman, assisted Litteral and both worked on Davis together. After two to three minutes Davis responded and was breathing naturally after five minutes. With the assistance of James R. Wolford, O. J. Carter, Jr., R. W. Waddell and R. M. Doss, Davis was taken to a doctor's office.

At a special meeting of department heads and the employees of System Transmission Department, composed of men working on the properties of the Appalachian Electric Power Company, The Kentucky and West Virginia Power Company and the Kingsport Utilities, Inc., the Edison Medal was awarded to Messrs. Litteral and W. I. Marshall. The award was made by Mr. D. C. Duncan, Safety Director for the Companies.

HOWARD HOYT'S LINE CREW

Michigan

A line crew of the Alma Division of the Consumers Power Company under the foremanship of Howard Hoyt was engaged on April 4, 1941, in removing the copper wire from a retired transmission line located about and on the same poles with a 4800-v grounded rural line. The method of removal was to leave the wires tight, untie them, push them out past the bottom crossarm on the grounded side of the rural line and drop them to the ground. Carl Busch, lineman, had finished untying the three wires on his pole and was waiting for the man on the next pole to complete his work. As he turned, his left spur cut out, he lost his balance and his left hand touched the 4800-v phase wire. With his right hand he grasped the three conductors being removed and which were on the ground a short distance away. Busch fell with his left arm over the 4800-v conductor and then slumped in his belt, breaking the contact. Lineman Fremont Bunce and Donald Seelinger went to his assistance, tied a hand line, cut his safety belt and lowered him to the ground, Foreman Hoyt assisting from the ground. Glen Johnson, truck driver, had gone at once to call a doctor and an ambulance. Howard Hoyt started artificial respiration at once and in three to five minutes, Busch was recovering and in ten minutes was breathing without assistance. Before the ambulance arrived Busch was taken in a farmer's wagon to the hospital.

Howard Hoyt's Line Crew of the Consumers Power Company. Left to right: H. J. Burton, General Safety and Operating Instruction Supervisor, Donald Seelinger, Howard Hoyt, Carl Busch (resuscitated lineman), Fremont Bunce and Glen Johnson.

The presentations were made at a banquet arranged in honor of the occasion at the Park Hotel in St. Louis, Mich., on the evening of Tuesday, Jan. 27, 1942. This was attended by the crew, including Messrs. H. Hoyt, Foreman; G. Johnson, F. Bunce, D. Seelinger, as well as Carl Busch, for whose resuscitation the awards were made. This banquet was also attended by Company officials from Jackson and from the Alma Offices. Following the dinner Mr. H. J. Burton made some interesting reports about the history of the Medal and told of the circumstances concerning the award of the first Resuscitation Medal to a Consumers Power employee. Following the remarks, Mr. A. E. Griegsmann, Assistant to the General Manager, presented the Crew Medal and Certificate as well as miniature replicas to the members of the Crew.

Horace L. Mann

HORACE L. MANN, President of Buffalo Niagara Electric Corporation, died January 10 at his residence 291 Beard Avenue, Buffalo, New York. He was 69 years old. Although ill for the past few months, Mr. Mann's death came as a distinct shock.

One of the pioneers in the development of the electric utility business in this section of the country, Mr. Mann was connected with Buffalo Niagara Electric Corporation and its predecessor company for the past 33 years, having joined Buffalo General Electric Company in 1909 as its treasurer. In 1926, when Buffalo Niagara and Eastern Power Corporation was organized, Mr. Mann was made Vice-President and Treasurer and a year later became a Director. In 1930 he was elected President of Buffalo General Electric Company, the predecessor of Buffalo Niagara Electric Corporation, which position he held at the time of his death. He was also vice-president and director of several western New York operating companies of the Niagara Hudson Power System, and was a director of Niagara Hudson Power Corporation.

Born in 1872 and educated in Middleburg, New York, he came to Buffalo in 1899 with the H. O. Company, cereal manufacturer, and was later connected with the New York and Buffalo Audit Company.

Electrical Equipment Committee Meeting

R. W. Wilbraham, *Chairman*

THE winter meeting of the Electrical Equipment Committee was held in Pittsburgh Feb. 2 and 3, with 30 members and 20 guests in attendance.

During the closed session on the first day there was discussion of various matters associated with the war effort, together with a review of apparatus troubles, oil fires, turbo generator outage rates, and committee activities relating to oil circuit breakers and rotating machinery standards. The second day was devoted to an open session at which there was consideration of generator insulation and testing, station design, air circuit breakers, system interconnection and progress reports on work of the Utilization, and Meters and Services Divisions.

The committee adopted a resolution expressing its appreciation of the long and effective service rendered by Mr. H. L. Wallau, and its regret at his resignation from the committee attendant on his retirement from the Electrical Utility industry.

Mr. George Sutherland, Utility Coordinator in the Industrial Salvage Section of the Bureau of Conservation, WPB, discussed the program for expediting the flow of scrap in the industry, as this is urgently needed for the war effort. He called attention to the two general classes of scrap, namely, industrial waste and obsolete materials and equipment. He stated that experience had shown the best way to get results was to have someone with authority put in charge of an active campaign to collect all available scrap. However, he emphasized the importance of making available for second-hand use by others equipment still having useful life but not applicable in its present owners hands. It was brought out that companies can interchange equipment on a barter or purchase basis, and the withdrawals from stock can be deducted as a credit on the P-46 report of withdrawals.

The reclamation and rehabilitation of equipment program of the Detroit Edison Company was reviewed by Mr. Clark. Examples of its application in connection with a changeover from 24 to 40 kv were described.

Messrs. Fitz and Hughes discussed operating and maintenance problems associated with the increased tempo of the war effort. New procedures, following the declaration of war, with regard to plant protection and provisions against sabotage were discussed, and experience with trial blackouts was described.

The annual report on oil fires was presented by Mr. Conwell, who called attention to the fact that only five cases were reported this year. A reduced number of reports indicates that the continual attention to provision of suitable methods of fire protection is giving substantial benefit. It was agreed that it was particularly important to continue the collection and study of these reports under present conditions.

The one year's trial period, during which the Proposed American Standard for Alternating Current Power Circuit Breakers was available for trial and criticism, is now completed. Mr. Henry requested that anyone having comments to send them in promptly to the American Standards Association so that they might be available when this Standard is reviewed and considered for recommendation as a regular American Standard.

The annual report for 1941 on Outdoor Bushing Failures was presented by Mr. Henry. These data show that the failure rates on modern bushings are still very low.

Information on the effect of the war on substation design made available through the Foreign Practice Group was presented by Mr. DeBeech.

Mr. Kent reported on the status of the revision of the Rotating Machinery Standard—ASA C50, which was started about a year ago. A revised edition was made available last fall, comments on which have recently been submitted by the utility group. It is expected there will be another meeting of the Sectional Committee at an early date to consider matters on which agreement has not yet been reached.

Mr. Mayott reviewed the situation leading up to the formation of the Southeastern power pool last fall, and discussed the operation of this pool and the results obtained.

The advantages of coordinated system interconnection were reviewed by Mr. Phillips, with particular reference to the utilization of reserve diversity and coordination of maintenance schedules. Mr. Phillips presentation was a very interesting discussion of this timely problem from the point of view of one intimately associated with interconnection matters.

The progress report on Outage Rates of Steam Turbine Generators and Boilers was reviewed by Mr. Dryar. This study has been under way for two years, but it appears that at least five years' data will be necessary to provide statistically reliable detailed results.

Further progress in the work of the subject committee on Generator Insulation and Testing was reported by Mr. B. R. Nevins. Additional insulation test data had been secured on two different synchronous condensers and a large turbo generator. The subject committee stated that it would be very glad to have volunteers from other companies than those already represented to assist in this work.

A series of interesting descriptions of some unusual sources of power were given by Messrs. Deardorff, Clark, Conwell and Fitz.

Mr. Shew called the attention of the committee to the fact that the construction and installation of compressed air tanks used for air circuit breakers are subject to laws, codes and regulations for unfired pressure vessels. He reviewed the status as to the various bodies having jurisdiction and indicated the scope of their activities. He also described an installation of 18 air blast circuit breakers. An interesting feature is that the air supply is through a closed loop piping system. Globe valves are provided so the system can be sectionalized at several points, but automatic check valves are used only at each breaker tank. There is sufficient air storage in the system to provide 18 breaker operations in addition to the two operations provided by each breaker tank.

Mr. W. J. Lyman presented a paper entitled "Matching the Load and System Capacity." This paper appears elsewhere in this issue of the BULLETIN.

The organization of three new ASA Sectional Committees dealing with electric flatirons, electric ranges and electric water heaters was described by Mr. Foote.

Further progress is being made on the study of utilization voltage. Mr. Foote called attention to the paper on this subject, presented by Mr. H. P. Seelye at the recent winter convention of the

AIEE held in New York City.

Mr. F. E. Davis explained that the Meter and Service Committee have not met since the date of his previous report in October. He reviewed recent developments in the matter of procurement of meters and meter equipment, and also progress in standardization matters. He called attention to the proposed standards for demand meters and stated that he would be glad to receive comments on these.

Transmission and Distribution Committee Meeting

E. V. Sayles, Chairman

PRACTICALLY the whole of the winter meeting of the Transmission and Distribution Committee, held at Cleveland, Ohio, Feb. 9 and 10, was devoted to reports, papers and discussions bearing on the war and defense situation.

The first half-day of the meeting was devoted to "War-time Design and Operation of Underground Systems," with Mr. T. G. Hieronymus, chairman of the Underground Group, presiding. Mr. C. B. Sharp, of the Detroit Edison Company, discussed a recent installation of 120 kv gas-filled cable that had been made in Detroit. This was followed with a discussion by Mr. I. T. Faucett, of the General Cable Company, on the design and characteristics of this table.

Mr. M. W. Ghen presented a progress report for E. W. Oesterreich, of the Duquesne Light Company, on "Cable Loadings for War Industry Loads." This report is published elsewhere in this issue of the BULLETIN. Mr. G. B. McCabe reported the results of his inquiry to Committee members, on the "AEIC Specifications For IPLC Solid Type Cable—Simplified Practice Schedule." This specification had been presented for discussion at the meeting of this Committee, held in Cincinnati, Oct. 20, 1941, at which time Mr. McCabe was requested to correlate the comments of those who had commented on this specification.

Mr. W. W. Satterlee, Westinghouse Electric and Manufacturing Company, presented a paper entitled "A New Air-cooled Transformer Promotes Safety and Simplifies Construction." Mr. Satterlee's paper described a new type of air-cooled transformer which is both fire and explosion proof, that has been developed and placed on the market. Its major insulations consist of air, porcelain, asbestos, mica, and glass. These transformers are cooled by the natural circulation of air through the windings, and has been supplied in sizes as large as 3000 kva, and in voltages up to and including 15,000.

In discussing the "Conservation of Man Power Through the Prevention of Accidents and Promotion of Safety," Mr. C. B. Boulet, Wisconsin Public Service Corporation, told of the lost time due to accidents during a year which had been converted into terms of building and constructing defense equipment. He called attention to the increasing trend of accidents in practically all phases of industry, and cautioned against overlooking this problem, due to the fact that longer hours are being worked, and to some extent, new and inexperienced men are replacing experienced workmen, who have been called into various phases of military and government service.

The afternoon session of Feb. 9 was devoted to discussions of power company problems during black-outs. Dr. S. G. Hibben, of the Westinghouse Electric and Manufacturing Company, demonstrated various types of equipment and methods used during black-outs, stressing the development of such black-out practices as would prove most efficient in connection with American conditions, and emphasizing that this country should not adopt a practice unless it had merit, merely because it had been used and proven satisfactory abroad. He discussed this subject from the viewpoint of facing actual conditions during raids, and included interesting information on the effect of fluorescence on various colored surfaces, and its application to outdoor signs.

Mr. O. K. Cornell, of the Buffalo, Niagara & Eastern Power Corporation, presented a paper on technical problems in connection with black-outs. Mr. Cornell's discussion involved equipment for black-out with various degrees of lighting intensities, and methods of control for street lighting circuits, that have been under consideration. The discussion following Mr. Cornell's paper brought out the procedure that has been established thus far in various sections of the country.

During the evening of Feb. 9, the meeting convened at Nela Park Auditorium of the General Electric Company. The members went to Nela Park by car, where they were served a dinner in the Nela Park Dining Room, and then witnessed a demonstration and listened to a discussion on black-out automobile lighting, by Mr. V. J. Roper, of the General Electric Company Automotive Laboratory. Following this, a forum program had been arranged under the direction of Mr. Kirk M. Reid, in the General Electric Institute Auditorium, with the following speakers:

I. E. S. War-Time Activities, W. C. Brown; Calculation of Threshold Brightness, G. S. Merrill; Low-Brightness Photometry, A. H. Taylor; Color as Affecting Seeing at Low Brightness, G. B. Buck, Jr.; Test Procedures of Army Engineers, D. C. Miller; Black-out Flashlights, G. F. Prideaux; and War-Time Street Lighting, K. M. Reid.

The forenoon session of Feb. 10 consisted of papers and discussions on the general subject of "Changes in Design to Avoid the Use of Critical Materials," with Mr. F. E. Sanford presiding.

Mr. H. J. Henderson, Ebasco Services Inc., gave a paper entitled "Conservation of Critical Materials Used on Overhead Lines." Mr. Henderson pointed out that it is the duty of engineers and operating men to find new ways to substitute most critical materials for non-critical, and to conserve the materials now on hand. He also emphasized the need for simplification and standardization of overhead lines equipment, looking toward the elimination of unnecessary sizes and varieties of manufactured articles.

"Modern Designs for Wood Substations" was the title of a paper presented by Mr. Ben H. Hughes, of the Hughes Brothers Company. Mr. Hughes described the design of wood structures, particularly those that are called upon to support heavy switches, or dead-end conductor loads, careful consideration to details becomes an important consideration in design.

Following Mr. Hughes' paper, Mr. H. N. Fox, of the Commonwealth & Southern Corporation, described some substations that had been erected by his company as a result of their inability to secure steel. Mr. Fox said that his company had approached this problem gradually, studying such experience as was available along the line of designing, detailing, and fabricating the structures.

He said that in the first few stations they had built, they had decided not to take advantage of the additional insulation provided by wood, but use the same insulation level as they had been using with steel. Hence they had grounded all equipment and insulator bases. Mr. Fox indicated that they were giving serious consideration to the electric features and problems involved in the design and use of this new type of substation.

Mr. Dale Chapman, of A. D. Chapman & Company, Inc., presented a paper entitled "The Preventative Treatment of Wood With Pentachlorphenol." Mr. Chapman pointed out that while this is not a new chemical, it having been made in chemical laboratories for many years, it has received significant attention in recent years, due to its excellent wood preservative properties and its low cost. Mr. Chapman's paper appears elsewhere in this issue of the BULLETIN.

This meeting concluded with brief discussions by Messrs. A. E. Silver, Ebasco Services Inc., and H. M. Jalonack, of the General Electric Company. Mr. Silver's discussion was presented by W. R. Bullard, and concerned the "Second Report of the EEI-NEMA Joint Committee on Standards for Distribution Transformers." Mr. Jalonack discussed this subject from the manufacturer's point of view, and pointed out the advantages of purchasing transformers in accordance with this standard. He called attention to the fact that this would make unnecessary large numbers of special features such as had been called for in the past, and would permit more prompt deliveries. He also said that due to the shortage of certain stocks of materials, it might be necessary to depart temporarily in some respects from this standard.

Mr. Sanford, in closing this session, called attention to the saving in steel that would result if transformers are mounted directly on poles, thus avoiding the use of hangers, such as has been the practice for many years in suspending transformers from crossarms.

The afternoon meeting started with a presentation by Mr. N. B. Walsh of the Duquesne Lighting Company, who presented a paper on "The Effects of Pole End Bonding in Lightning Arrester Protected Cable Installations." Mr. Walsh gave the results of a study that the Duquesne Light Company had made on various types of lightning arresters used in the protection of cable terminals. Mr. Walsh's paper is included elsewhere in this issue of the BULLETIN.

Following this presentation the meeting was turned over to Mr. W. F. Nimmo of the Virginia Electric and Power Company, and former chairman of this Committee. The subject under discussion was "Used Materials—Their Importance and Methods of Reclaiming." Mr. G. H. Sutherland, of the War Production Board, was present, and discussed the "Useful Salvaging of Scrap Materials." Mr. Sutherland gave an interesting discussion on the War Production Board's regulations and procedure with regard to the critical materials in which power companies are interested. In addition, Mr. Sutherland answered numerous specific questions.

This meeting of the Committee was well attended, in view of the present conditions, there being approximately 110 registered. Chairman Sayles explained that the next meeting of the Committee would probably be held during the first week in May, but that the program would not be definitely formed until later, in order that it may include discussions of the problems which are constantly arising, due to the war situation.

Prime Movers Committee Meeting

J. A. Keeth, *Chairman*

THE Prime Movers Committee met in Baltimore Feb. 9 and 10, with a total of sixty in attendance.

Mr. George Sutherland of the W.P.B. Bureau of Industrial Conservation explained the program under way to expedite the movement of scrap material and to encourage the use of second-hand material and equipment. He stated that an agency had been set up in Washington to assist in the disposition of usable material and equipment. Letters in this regard should be addressed to Mr. M. R. Van Benschoten of the Inventory and Requisition Section, Compliance and Inventory Branch, Industry Operations Division, Wing 1, Second Floor, Tempo. E, 6th Street and Adams Drive, Washington, D. C.

Mr. G. S. Diehl, Chairman of the Accident Prevention Committee, discussed the status of the accident prevention work and suggested the advantages of joint consideration with the Prime Movers Committee of particular classes of problems of mutual interest.

Reports were received from the various standing subcommittees. Mr. Van Duzer stated that a draft had been completed of the 1941 report on Boilers and Combustion, and briefly reviewed the contents of the report.

There was considerable discussion of the inadvisability of interpolation between ASA requirements for thicknesses of valves and fittings. The committee went on record as to the desirability of the ASA Sectional Committee giving consideration to the need for providing an intermediate standard between 900 lb. and 1500 lb.

A considerable portion of the meeting was devoted to a round table discussion of power generation problems, which was conducted by Mr. J. R. Baker.

Following the meeting the members took advantage of an opportunity provided by the Consolidated Gas, Electric Light and Power Company of Baltimore to visit the Westport Station.

The next meeting of the committee will be held the first week of May in Chicago, in conjunction with meetings of the other engineering committees.

Appraisal of Methods for Estimating Service Lives of Utility Properties Is Now Available

THE comprehensive "Appraisal of Methods for Estimating Service Lives of Utility Properties," a study undertaken several months ago by the Depreciation Committees of the EEI and AGA, has been completed and submitted to the Committee on Depreciation of the National Association of Railroad and Utilities Commissioners.

The study represents an immense amount of intensive work, much of it done under extraordinary pressure in the midst of preparation for National Defense and, since December 7, 1941, for actual war, and while it may be considered in some degree a guide to financial and operating management, it is primarily a factual report, not an argument or a proposal. It contains the following six sections: Summary; Actuarial Methods of Estimating Service Life; Turnover Methods of Estimating Service Life; Forecast Methods of Estimating Service Life; Technique in Handling Data; General Appraisal of Methods.

The membership of the EEI and AGA Depreciations Committees includes accountants and engineers, but this particular study, from its nature, represents primarily the work of the engineering members. However, the accountants were in close and continuous conference with the engineers during the development of this study, and are in general agreement with their findings of fact.

The Appraisal (264 pages, including 30 charts and numerous tables) may be obtained from the Edison Electric Institute at the following prices: $2.00 per copy for member companies; $3.50 for non-members.

Kitchen Planning Manual Proves Timely Aid

MANY dealers throughout the country are finding that selling complete planned kitchens can be the answer to lack of business due to appliance shortages. The cabinets, floor coverings, etc., that go to make up the kitchen provide a diversified business, yet are closely related to the major appliances with which the dealers are familiar.

Naturally, the dealer has many questions to ask when he considers selling these products, and utility dealer contact men have found that "The Principles of Modern Kitchen Planning," a manual prepared by The Modern Kitchen Bureau, has proved to hold many of the answers.

Floor plans, elevations and photographs of typical all-electric kitchens are found on practically every page of this large size, 20-page booklet. Information on kitchen planning includes detailed illustrations of the six fundamental arrangements of equipment: U-shape, L-shape, two-wall, broken U, broken L, and individual.

The particular requirements of the farm kitchen, and those in city apartments and suburban homes, are discussed and analyzed, so that the dealer may know how to go about planning a kitchen for almost any location.

The three principal kitchen work centers—food storage, cleaning-dishwashing, and cooking-serving—are shown in elevation, with practical suggestions for the proper location of cabinets storing appliances, cleaning supplies and food.

Facts, figures and suggestions on planning cabinets and work surfaces, with data on proper height of cabinets, clearances between work counters and the bottom of wall cabinets, estimating adequate cabinet storage space and a table of average storage requirements for all types of dwellings, make up still another highly practical section.

A chapter on trends in modern kitchens, incorporating up to the minute information secured from architects, kitchen planners, women's magazines, etc., will help the dealer to be sure that he is giving his women customers the modern kitchens and new conveniences that they really want.

Other sections that should be of real assistance to the dealer in his daily work include one on modernizing the old kitchen, another on the particular needs of the farmer's wife in her kitchen, the latest practices in lighting and wiring the all-electric kitchen, financing equipment cost, etc., are found in the manual.

Among the successful electric kitchens illustrated in this booklet are an unusual farm "living" type of kitchen by William Hamby, famous architect, and electric kitchens in the House of Ideas, sponsored by *Collier's Magazine* and exhibited at Rockefeller Home Center, and in a No. 2 Life Home built by Thorpe Brothers in Minneapolis.

"The Principles of Modern Kitchen Planning" will prove to be just what the alert dealer needs, as he makes ready to sell the new lines that will tide him over the war period. Copies of the manual may be secured from The Modern Kitchen Bureau, 420 Lexington Ave., New York, N. Y., at 25c. each.

PERSONALS

HENRY B. BRYANS has been elected vice-president of the American Standards Association for the year 1942. Mr. Bryans is executive vice-president and director of the Philadelphia Electric Company.

J. E. DAVIDSON, president of the Nebraska Power Co., is celebrating 25 years' service with the company. At informal ceremonies in Mr. Davidson's office, Roy Page, vice-president and general manager, presented to him a ruby-studded 25-year service pin.

L. M. SHADGETT, vice-president of the Georgia Power Co. has been named a member of the public utilities committee of the Georgia Defense Council, representing the electric utilities of the state.

JAMES W. CARPENTER, vice-president of the Long Island Lighting Co., has been elected president of the Electrical and Gas Association of New York, Inc.

HERMAN L. WALLAU, who recently retired as electrical engineer for the Cleveland Electric Illuminating Co., after 40 years of service, is now serving as principal electrical engineer at the Aircraft Engine Research Laboratory, Cleveland. During his affiliation with the Cleveland utility, Mr. Wallau was electrical designer of many of its large power plants, including the Lake Shore, Avon and Ashtabula units.

JOHN S. WOOD, director of industrial sales, Philadelphia Electric Co., has been appointed emergency defense coordinator of the Philadelphia Electric Co. System, reporting to the executive vice-president. In this capacity Mr. Wood will have charge of all emergency activities within the company relating to the war effort.

JOHN B. FISKEN, safety engineer for the Washington Water Power Co. and an employee of the company since its founding in 1889, has retired from active service. He served as company light and power superintendent from 1889 until 1918 when he became chief engineer. Two years later he was named consulting engineer and has served as safety engineer since February, 1939. He is a past-president of the Northwest Electric Light and Power Association and a fellow of the American Institute of Electrical Engineers.

HOWARD F. REECE has been appointed rate engineer for the Consumers Power Co., Jackson, Mich. Mr. Reece has been connected with Consumers Power and its affiliated companies for about 18 years. Included in his well-rounded experience has been work in the construction department, the Battle Creek steam plant and some 15 years in various phases of rate department activities with Hodenpyl-Hardy Co. (predecessor to Commonwealth & Southern), Allied Power and Light, and the Commonwealth & Southern Corp.

R. F. PULVER has been appointed to the position of general sales manager of Minnesota Power and Light Co., Duluth, to succeed the late J. E. Lynch.

First entering the employ of Minnesota Power and Light Co. in 1924 as power sales engineer, Mr. Pulver has since acted in various sales capacities and was industrial sales manager at the time of his appointment.

E.E.I. PUBLICATIONS AND PROMOTIONAL MATERIAL

(Prices include transportation in U. S. only. Please order by number shown before title. Standing Orders may be placed for a specified number of copies of reports of various committees as issued, to be shipped to one address.)

Payable in United States Currency—Postage Stamps Not Acceptable

Accounting and Statistical

	Members	Non Members
Accounting		
Digest of Authoritative Opinions of the Definition of Original Cost (Including Appendix on "Prudent Investment") 1938	$1.50	$1.50
Proceedings—National Accounting Conferences		
Complete Set—5th Conference 1941	2.00	2.00
" " 4th " 1940	2.00	2.00
" " 3rd " 1939	2.00	2.00
" " 2nd " 1938	1.50	1.50
by Groups Yearly—		
Classification of Accounts	.50	.50
Customer's Relation	.50	.50
Depreciation	.50	.50
Plant Accounting and Records	.50	.50
Purchasing Stores & Transportation	.50	.50
General Sessions	.50	.50
Summary of Definitions Covering Depreciation and Related Terms 1939	1.00	1.00
Statistical		
1-2—Electric Light and Power Industry in 1940 (5/41)	.30	.75
H-2 Electric Light and Power Industry in 1939 (3/40)	.30	.75
(Statistical Bulletins also available for years 1932 to 1938 inclusive) each	.30	.75
Weekly, Monthly and Annual Statistics (Includes Annual Statistical Bulletin; Weekly Electric Power output; Monthly Electrical Research Statistics; Refrigerator and Range Sales)	2.00	2.00

Engineering Committees

ACCIDENT PREVENTION—RESUSCITATION

	Members	Non Members
E-12—Resuscitation Booklets (7/37) 1— 9 copies	.10 each	
10— 99 "	.08 "	
100—499 "	.06 "	
D-18—Your Unseen Helper (1936) 1,000	$10.	
5,000	30.	
10,000	50.	
25,000	110.	
C-14—Resuscitation Charts (4/36)	.10	.10
C-12—Twelve Messages on Accident Prevention in the Electric Public Utilities (12/35)	.10	.10

ELECTRICAL EQUIPMENT COMMITTEE

F-13—Reconditioning Flood Damaged Electrical Equipment (12/38)	$ .30	$ .75
F-5—Design of Switchhouses for Generating Stations and Transmission Substation (6/38)	.40	1.00
E-1—Rectifier Wave Shape (4/37)	.40	1.00
C-10—Symbols for Metering Diagrams (12/35)	.10	.10
B-10—Electrical Energy Diversion (10/34)	.20	.50
A-16—Load and Revenue Forecasting (7/33)	.30	.75
A-11—Load Area Development (7/33)	.30	.75

HYDRAULIC POWER COMMITTEE

D-15—Penstocks (12/35)	1.00	2.50
A-19—Hydraulic Governors (8/33)	.20	.50

JOINT REPORTS

I-9—Standards for Distribution Transformers (Second Report) EEI-NEMA (12/41)	.25	.60
I-8—Susceptiveness of Subscriber Station Sets—Engineering Report No. 46—Joint Subcommittee on Development and Research (12/41)	.60	1.50
I-7—Frequency Weighting for Message Circuit Noise—Engineering Report No. 45—Joint Subcommittee on Development and Research (12/41)	.20	.50
H-12—Neutralizing Transformers—Engineering Report No. 44—Joint Subcommittee on Development and Research (7/41)	.30	.75
H-10—Effects of Bonding Exchange Aerial Telephone Cable Sheaths to Multi-Grounded Power Neutrals—Engineering Report No. 43—Joint Subcommittee on Development and Research (6/41)	$0.30	$0.75
H-8—Standard Basic Impulse Insulation Levels — AIEE - EEI - NEMA (1/41)	.05	.05
H-3—Inductive Coordination Aspects of Petersen Coil Grounding—Engr. Report No. 42—Joint Subcommittee on Development and Research (12/40)	.25	.65
H-1—Test Specifications for Household Electric Ranges—EEI-NEMA (5/40)	.20	.50
G-9—Methods of Measuring Radio Noise—EEI-NEMA-RMA (2/40)	.20	.50
G-6—Standards for Distribution Transformers (First Report)—EEI-NEMA (2/40	.25	.60
F-17—Short-Circuiting Relay Protectors—Engr. Report No. 41—Joint Subcommittee on Development and Research (8/38)	.40	1.00
F-8—Test Specifications, Automatic Electric Storage Water Heaters—EEI-NEMA (10/38)	.20	.50
F-2—Inductive Coordination of Rural Power and Telephone Systems—Engr. Report No. 40—Joint Subcommittee on Development and Research (1/38)	.80	2.00
E-12—Resuscitation Booklets — EEI-AGA (7/37)	.10	.10
E-9—Characteristics of Power System Faults to Ground-Engr. Report No. 39—Joint Subcommittee on Development and Research (11/37)	.60	1.50
E-5—Principles and Practices for Inductive Coordination, EEI-AAR (1/37)	no charge	no charge
E-4—Joint Use of Poles 6.6 and 13.2 kv. Safety Features—EEI-Bell Tel. (1/37)	.30	.75
E-3—Jointly Used Wood Pole Lines Specifications—EEI-Bell Tel. (1/37)	.50	1.50
Power Level and Sensitivity of Telephone Circuits—Engr. Report No. 38—Joint Subcommittee on Development and Research (1936)	.40	1.00
Computation of Zero-Sequence Impedance of Power Lines and Cables—Engr. Report No. 37—Joint Subcommittee on Development and Research (1936)	.80	2.00
Selected Devices for Reducing Harmonics in Power Systems—Part II—A-C Systems—Engr. Report No. 34—Joint Subcommittee on Development and Research (1936)	.80	2.00
D-14—Vol. IV—Engineering Reports of the Joint Subcommittee on Development and Research (1/37)	5.00	10.00
D-13—Vol. III—Engineering Reports of the Joint Subcommittee on Development and Research (1/37)	5.00	10.00

PRIME MOVERS COMMITTEE

I-6—Metallurgy and Piping, 1940 (12/41)	.70	1.75
I-4 Boiler Auxiliaries, 1940-1941 (10/41)	.80	2.00
H-11—Power Station Chemistry, 1940 (7/41)	.40	1.00
H-9—Turbines, Condensers and Associated Equipment (4/41)	.80	2.00
H-7—Boilers—Combustion, 1940 (3/41)	1.60	4.00
G-10—Boilers, Superheaters, Economizers, Air Heaters & Piping, 1939 (4/40)	.80	2.00
G-7—Turbines, Condensers and Pumps (1/40)	.70	1.75
G-3—Combustion, 1939 (12/39)	.80	2.00
F-15—Boilers, Superheaters, Economizers, Air Heaters and Piping, 1938 (12/38)	1.00	2.50
F-14—Turbines, Condensers and Pumps, 1938 (12/38)	.70	1.75
F-12—Combustion, 1938 (11/38)	1.00	2.50
E-16—Boilers, Superheaters, Economizers, Air Heaters and Piping, 1937 (12/37)	.90	2.35
E-15—Oil and Gas Engines, 1936-1937 (10/37)	.40	1.00
E-14—Turbines, Condensers and Pumps, 1937 (9/37)	.60	1.50
E-11—Combustion, 1937 (9/37)	.80	2.00
E-10—Power Station Chemistry, 1937 (9/37)	.30	.75
D-11—Turbines, Condensers, Feedwater Heaters and Pumps, 1936 (11/36)	$0.60	$1.50
D-10—Oil and Gas Engines, 1935-1936 (10/36)	.40	1.00
D-8—Superposition of High Pressure Non-Condensing Equipment on Existing Power Stations (10/36)	.25	.65
D-7—Combustion, 1936 (10/36)	.60	1.50
D-6—Boilers, Economizers, Air Heaters and Piping, 1936 (9/36)	.60	1.50
D-5—Power Station Chemistry, 1936 (7/36)	.20	.50
C-8—Oil and Gas Engines, 1934-1935 (10/35)	.50	1.25
C-6—Combustion, 1935 (8/35)	.80	2.00
C-5—Turbines, Condensers and Feedwater heaters, 1935 (7/35)	.40	1.00
C-4—Boilers, Economizers, Air Heaters and Piping, 1935 (7/35)	.60	1.50
B-8—Steam Generation (8/34)	.60	1.50
B-7—Oil and Gas Engines (8/34)	.40	1.00
B-5—Station Piping, 1934 (7/34)	.60	1.50
B-4—Turbines, 1934 (6/34)	.40	1.00
B-3—Condensers, Feedwater Heaters, Evaporators, and Boiler Feed Pumps (6/34)	.45	1.15
A-7—Stoker Equipment and Furnaces (8/33)	.60	1.50
A-6—Pulverized Fuel (8/33)	.75	1.85
A-5—Power Station Chemistry (7/33)	.40	1.00
A-4—Burning of Liquid and Gaseous Fuels (7/33)	.30	.75
A-3—Turbines (8/33)	.75	1.85
A-2—Station Piping (8/33)	.60	1.50

TRANSMISSION AND DISTRIBUTION COMMITTEE

H-6—Distribution Transformer Load Supervision (3/41)	.60	1.50
H-5—Cable Operation, 1939 (1/41)	.60	1.50
G-5—Cable Operation, 1938 (1/40)	.60	1.50
G-1—A.C. Network Operation, 1936-1937 (8/39)	.80	2.00
F-16—Cable Operation, 1937 (12/38)	.60	1.50
F-10—Tree Trimming Practices (10/38)	.20	.50
F-9—Conductor Sags and Tension for Rural Lines (10/38)	.40	1.00
F-7—Economical Distribution Transformers Loading and Thermal Performance of Distribution Transformers (8/38)	.40	1.00
F-6—Lightning Proof Transmission Lines (7/38)	.60	1.50
F-3—Distribution Transformer Load Characteristics (4/38)	1.00	2.50
F-1—Treatment and Inspection of Creosoted Pine Poles (2/38)	.30	.75
E-17—Cable Operation, 1936 (12/37	.60	1.50
E-8—A.C. Network Operation, 1934-1935 (6/37)	.70	1.60
D-17—Cable Operation, 1935 (12/36)	.60	1.50
D-9—Principles and Practices in Grounding (10/36)	.40	1.00

SUGGESTIONS FOR SPECIFICATIONS

10 to 49 copies 25% discount
50 or more copies 50% discount

MS-1—Suggestions for Specifications for Standard Dial Constants for Alternating Current Watthour Meters (8/40)	.10	.10
MS-2—Suggestions for Specifications for Coordinated and Standardized Low Voltage Metering Current Transformers (8/40)	.10	.10
TD-1—Suggestions for Specifications for Bolts and Nuts (5/37)	.20	.20
TD-2—Suggestions for Specifications for Anchor Rods (6/39)	.10	10
TD-3—Suggestions for Specifications for Lag Screws (10/38)	.10	.10
TD-4—Suggestions for Specifications for Eye Bolts (6/39)	.10	.10
TD-5—Suggestions for Specifications for Eyenuts and Eyelets (4/41)	.10	.10
TD-6—Suggestions for Specifications for Steel Crossarm Braces (5/40)	.10	.10
TD-8—Suggestions for Specifications for Straight Tinned Copper Connectors (10/40)	.10	.10
TD-10—Suggestions for Specifications for Rolled Steel Washers (5/40)	10.	.10
TD-51—Suggestions for Specifications for Low and Medium Voltage Pin-Type Insulators (5/37)	.10	.10
TD-61—Suggestions for Specifications for Type "A" Untreated Douglas Fir Crossarms (11/40)	.10	.10
TD-62—Suggestions for Specifications for Type "B" Untreated Douglas Fir Crossarms (11/40)	.10	.10
TD-71—Suggestions for Specifications for Insulator and Pin Threads and Gauges (5/37)	.10	.10

General Commercial Committees

	Members	Non Members
Air Conditioning		
Air Conditioning Installations, 1941	$1.00	$1.00
Air Conditioning Installations, 1940	1.00	1.00
(Air conditioning installation reports also available for 1934-35-36)		
Lighting		
Typical Promotional Programs — Home Lighting Equipment (1941)	.35	.35
Power		
G-4—Electric Metal-Melting Furnaces (1/40)	.80	2.00
F-11—Electrification of Oil Refineries (10/38)	.30	.75
C-13 Steam and Electrical Requirements of Hotels (12/35)	.30	(members only)
C-2 Steam and Electrical Requirements of Office Building (4/35)	.30	.75
Power Sales Manual (1941)	3.50	5.00
Water Heating		
I-5 Standardization of Electric Water Heating Equipment (10/41)	.20	.50

National Promotional Programs

Commercial Cooking		
Commercial Cooking Survey, 1941	$ .25	.25
Sales Training Manual—Commercial Electric Cooking, 1941	1-4 copies	$1.50
	5-14 "	1.25
	15 or more	1.00
Domestic Cooking		
Meals Go Modern Electrically	.10	.10
Electric Kitchens		
It Can Happen In Your Kitchen	$2.80 per 100	
She Runs a Beauty Parlor in Her Kitchen	.04	.04
I Just Had My Face Lifted Electrically	.04	.04
How to Plan a Modern All-Electric Kitchen	$2.00 per 100	
The Principles of Kitchen Planning	.25	.25
Films		
"It Happened In The Kitchen"—16 mm. full color, talking motion picture. Including complete promotional program	$212 plus excise tax	
"Sales Training"—Series of 10 films and 10 discussion manuals. Five on basic selling and five on product selling, i.e., refrigerators, ranges, roasters, water heaters and laundry equipment. Price on meter basis for entire series	$125 to $275	
Lighting		
Better Light—Better Sight— Better Production	$2.50C	$2.50C
Better Light—Better Sight— Better Living	2.50C	2.50C
Better Light—Better Sight— Better Sales	2.50C	2.50C
Priceless Eyes	4.50C	4.50C
Films		
"Time to Relight"—(Commercial) sound slide 15 minutes, 85 pictures	$10.00 film & disc	
"Light Up—Step Up"—(Industrial) sound slide 15 minutes, 75 pictures	10.00 " " "	
"You Can Do Something About It"—(Home) sound slide, 15 minutes, 95 pictures	10.00 " " " ($22.50 per set with 30 frames in color)	
"Light Makes Sight"—16 mm. full color, talking motion picture	$135.00 plus excise tax	
(Additional prints)	$ 80.00 plus excise tax	
Wiring		
Rewiring for Commercial and Industrial Buildings	.25	.25
Basic Factors of Adequate Wiring —1939	.25	.25
Covered Neutral Cable Helps Sell Adequate Home Wiring—1939	.25	.25
Commercial Building Re-wiring Market—1939	.35	.35
(Price on above three books as a group is 60c per set)		
Films		
Commercial Re-Wiring — lantern slides	Set	$17.50
Home Wiring—lantern slides	Set	35.00

Miscellaneous, Reference Books, Etc.

	Members	Non Members
Code for Electricity Meters (1941)	1.60	2.00
Electrical Metermen's Handbook (1940)	2.40	3.60
Good Radio Reception (1937)	100	4.00
	1000	25.00
	3000	60.00
	5000	95.00
Objective Type Rates, 1933-1936	.80	2.00
Power Sales Manual (1941)	3.50	5.00
Rate Book, 1941	10.00	25.00
Rewiring for Commercial and Industrial Buildings (1941)	.25	.25
Sales Training Manual—Commercial Electric Cooking (1941)	$1.50	$1.50
Storm Loading and Strength of Wood Pole Lines and a Study of Wind Gusts (1936)	2.00	5.00

Periodicals

	Members	Non Members
Better Light—Better Sight News (9 issues yearly)	.75	.75
Edison Electric Institute Bulletin (Monthly)	2.00	2.00
Modern Kitchen Bureau News (Bi-Monthly)	Free	Free
Rural Electrification Exchange (Quarterly)	.60	1.00

Home Service Today

THE role of the electric utility home economist in a nation at war, and the many contributions made by her along the lines of proper use of electrical equipment for greatest efficiency, conservation and health, are outlined in "Home Service Today: A Guide to Home Service Activities in the Electric Utility Company," a new publication of the Home Service Committee, EEI, of which Miss Fern Snider, Georgia Power Company, is Chairman.

Anything that can be done to keep the people well, make the home livable and promote efficiency within the home, will help to maintain a victorious morale, the booklet states. In the face of existing conditions, home service work will continue to be both helpful and productive for the customer and the utility, as well as the community.

The booklet describes specific activities which are a part of a timely home service program, designed to meet today's conditions.

Work with customers' present equipment, to make sure that it is as efficient as possible and cared for by the customer to extend its useful life, will help to combat shortage of replacements. The electric range, refrigerator and smaller appliances can all be checked by the home economist to make sure of their condition, and to make them of greatest value to the customer. The home service woman can make simple repairs to bring appliances back into use, and give customers information on proper use.

Lighting conditions in the home are of more importance than ever before. Eyestrain means bodily fatigue and lowered efficiency, and the utility home lighting service can make a definite contribution to the welfare of both the customer and the nation. Proper placing of lamps and fixtures, information on lamp sizes and models, etc., can be done by the home economist on a lasting educational basis with each customer.

Kitchen improvement by planned arrangement of appliances and equipment, fuse renewal instructions, information on adequate wiring for both old and new homes, are all proper phases of the home economists' work, the booklet states.

The home service representative who is also a home economist is able to give helpful instruction on nutrition. Information on proper diets for improved health, home canning, the values of different foods, all fall within the scope of the home service woman's work, and give her a unique opportunity to serve customers.

"In normal times utility home economists, through their routine duties, have many opportunitties to interpret home economics in the strictest sense. Today, however, through broadening our interpretation and doing our job supremely well, we can make home economics a power in every phase of community life to the end that the good effects will be felt long beyond the emergency period," the booklet concludes.

The booklet is available through EEI, at 25c. per copy.

EEI PUBLICATIONS

A newly revised catalog of all EEI publications is available upon request to

EDISON ELECTRIC INSTITUTE

420 Lexington Avenue
New York, N. Y.

Effects of Pole End Bonding

(*Continued from page 56*)

tection was very poor, as has been shown, governed in this case entirely by the bonding. Under our improved bonding methods, we now have not only the good protection for long low currents that we had before, but also the best protection for short, high currents. Formerly, we were protected for 25 per cent of the surges, or less; now, with pole-top bonding, our protection covers all surges limited in effectiveness only by the arresters available.

The results of some previous impulse breakdown tests performed on samples of cable, potheads, and joints have shown the following:

1. Good 22-kv joints have an impulse strength of from 275 kv to 400 kv.
2. New 22-kv cable (24/64" insulation) has an impulse strength of approximately 600 kv, while cable with 18/64" insulation has a strength of about 460 kv. The newest cables are supposed to exceed these values. Shielded conductor construction is also claimed to offer advantages.
3. A good 37-kv pothead has an impulse strength of approximately 425 kv.
4. Old, dry (due to compound migration) cable has shown an impulse strength as low as 150 kv. This value was obtained on a sample which was deliberately heated and dried in a vacuum.
5. Old potheads have shown an impulse strength as low as 255 kv.
6. Over a period of 13 years, from 1928 to November, 1941, there were 83 22-kv cable failures on the Duquesne Light Company system due to lightning, of which 55, or 66%, were in joints. Upon subsequent examination, it was disclosed that the majority of joint failures were of the old-style joint. These joints were made with either dry varnished cambric tape or paper tape which it was very difficult to apply without wrinkling, and the conductor insulation was "penciled" rather than "stepped." Such joints are inherently inferior in design and low in impulse strength, probably 100 kv or less in some cases. The later-type joints which failed were discovered to have been weakened principally by the entrance of moisture through a defective seal or wipe. Future tests are being considered to determine the impulse strength of joints in service and to investigate the effect on impulse strength of the shielded conductor-type of cable construction. It is hoped that this information will be suitable for presentation in the near future.

In consideration of the insulation levels just mentioned and the results of the foregoing bonding tests, certain conclusions are suggested:

First—the greatest protection from any arrester is achieved by reducing the ground discharge path to a minimum. This suggests mounting the arrester as close to the pothead as possible, preferably right beside it on the same bracket. This principle has been utilized for several years in the lightning protection of transformers where the arrester is mounted directly on the transformer case. There is no reason why it should not apply to cable terminal installations as well.

In the event where time or expense prohibits the redesigning of the pole top construction necessitated by such a change, the bonding should be moved up the pole as close to the base of the pothead as is feasible. This, at least, is a move in the right direction, and results in approximately 55 per cent of the maximum improvement possible.

Second—the older-type arresters have been shown to be inferior in performance and should be replaced, wherever possible, by the later, more modern types.

Third—it is believed that a definite reduction in the failure rate will result from the adoption of these practices. If we look at Fig. 13, we see the approximate insulation levels previously mentioned. In addition, we have drawn in the voltage imposed on the equipment under the old bonding methods and using a type "C" arrester (upper dashed line). The equipment in the shaded areas below this line would fail if subjected to a surge of this magnitude, or greater. At 170 kv, we have drawn another voltage line representing the voltage under the best bonding condition and using the type "A" or "D" arrester (lower dashed line). Thus, we would expect to eliminate all pothead failures, at least 90 per cent cent of the cable failures, and a large percentage of the joint failures. The low limit of 150 kv for old, dry cable risers can very likely be raised above the line if we can avoid migration of cable compound. This might be accomplished by filling the pothead with the "tacky" type cable grease instead of the present joint compound. By keeping the vertical riser thus saturated, the impulse strength should be raised and the lower factor lowered.

Although this study is far from complete, we feel that the conclusions reached are reasonable and will result in improved service and operating economy.

CONVENTIONS AND MEETINGS

1942

FEBRUARY

2-3	Electrical Equipment Committee, EEI, Pittsburgh, Pa.
9-10	Prime Movers Committee, EEI, Belvedere Hotel, Baltimore, Md.
9-11	Transmission and Distribution Committee, EEI, Hotel Cleveland, Cleveland, Ohio.
16-20	National Electrical Manufacturers Association, Palmer House, Chicago, Ill.
23-24	Accident Prevention Committee, William Penn Hotel, Pittsburgh, Pa.

MARCH

4-6	Canadian Electrical Association and Northwestern Electric Light & Power Association, joint meeting, Business Development Section and Commercial Section, Vancouver, Can.
12	Southeastern Electric Exchange, Engineering and Operating Section, Sir Walter Hotel, Raleigh, N. C.
23-24	Oklahoma Utilities Association, Biltmore Hotel, Oklahoma City, Okla.
23-25	American Society of Mechanical Engineers, spring meeting, Rice Hotel, Houston, Tex.
24-26	General Power Conference, EEI, Edgewater Beach Hotel, Chicago, Ill.
26-27	Missouri Valley Electric Association, Hotel Continental, Kansas City, Mo.

APRIL

9-10	Midwest Power Conference, Palmer House, Chicago, Ill.
14-15	Missouri Association of Public Utilities, Jefferson Hotel, St. Louis, Mo.
16-17	Southeastern Electric Exchange, Annual Conference, Edgewater Gulf Hotel, Edgewater Park, Miss.
17	Maryland Utilities Association, Lord Baltimore Hotel, Baltimore, Md.
27-30	Chamber of Commerce of the U. S. A., Washington, D. C.

MAY

6-8	Electrical Manufacturers Club, The Homestead, Hot Springs, Va.
10-15	National Electrical Manufacturers Association, The Homestead, Hot Springs, Va.
11-15	National Fire Protection Association, Atlantic City, N. J.
17-21	National Electrical Wholesalers Association, The Homestead, Hot Springs, Va.
22-26	Westinghouse Agent-Jobbers Association, The Homestead, Hot Springs, Va.
25-28	National Association of Purchasing Agents, New York, N. Y.

JUNE

1-4	EDISON ELECTRIC INSTITUTE, annual convention, Atlantic City, N. J.

OFFICERS AND COMMITTEES OF THE EDISON ELECTRIC INSTITUTE

1941-1942

OFFICERS

C. W. KELLOGG, *President*
420 Lexington Avenue, New York, N. Y.

PAUL M. DOWNING, *Vice-President*
Pacific Gas & Electric Co., San Francisco, Cal.

J. E. DAVIDSON, *Vice-President*
Nebraska Power Co., Omaha, Neb.

W. E. MITCHELL, *Vice-President*
Georgia Power Co., Atlanta, Ga.

H. S. BENNION, *Vice-President & Managing Director*
420 Lexington Avenue, New York, N. Y.

J. C. LEIGHTON, *Treasurer*
Engineers Public Service Co., New York, N. Y.

MAE B. WOODS, *Secretary*
420 Lexington Avenue, New York, N. Y.

OPERATING COMMITTEE

Chairman, C. W. KELLOGG, New York, N. Y.

E. R. ACKER, Central Hudson Gas & Electric Corp., Poughkeepsie, N. Y.

J. M. BARRY, Alabama Power Co., Birmingham, Ala.

H. C. BLACKWELL, The Cincinnati Gas & Electric Co., Cincinnati, Ohio.

H. B. BRYANS, Philadelphia Electric Co., Philadelphia, Pa.

W. H. BURKE, Ebasco Services Incorporated, New York, N. Y.

C. L. CAMPBELL, The Connecticut Light & Power Co., Hartford, Conn.

J. E. DAVIDSON, Nebraska Power Co., Omaha, Neb.

PAUL M. DOWNING, Pacific Gas and Electric Co., San Francisco, Calif.

WILLIAM KELLY, Buffalo Niagara & Eastern Power Corp., Buffalo, N. Y.

J. C. LEIGHTON, Engineers Public Service Co., New York, N. Y.

FRANK MCLAUGHLIN, Puget Sound Power & Light Co., Seattle, Wash.

W. E. MITCHELL, Georgia Power Co., Atlanta, Ga.

J. F. OWENS, Oklahoma Gas & Electric Co., Oklahoma City, Okla

W. H. SAMMIS, The Commonwealth & Southern Corp., New York, N. Y.

CHESTER C. SMITH, Kansas City Power & Light Co., Kansas City, Mo.

PHILIP SPORN, American Gas & Electric Service Corp., New York, N. Y.

E. C. STONE, Duquesne Light Co., Pittsburgh, Pa.

E. S. THOMPSON, American Water Works & Electric Co., New York, N. Y.

G. W. VAN DERZEE, Wisconsin Electric Power Co., Milwaukee, Wis.

P. S. YOUNG, Public Service Electric & Gas Co., Newark, N. J.

CHAIRMEN OF THE COMMITTEES

Accident Prevention, GEORGE S. DIEHL, Pennsylvania Water & Power Co., Baltimore, Md.

Accounting Executive, G. H. BOURNE, The Commonwealth & Southern Corp., New York, N. Y.

Customers' Relations, Commercial Accounting and Collections, H. R. FLANEGAN, Philadelphia Electric Co., Philadelphia, Pa.

Depreciation, H. L. GRUEHN, Consolidated Gas Electric Light & Power Co., Baltimore, Md.

General Accounting, to be announced.

Plant Accounting and Records, H. B. HARDWICK, The Commonwealth & Southern Corp., New York, N. Y.

Purchasing Stores and Transportation, W. P. MCARDLE, Ebasco Services, Inc., New York, N. Y.

Electrical Equipment, R. W. WILBRAHAM, United Engineers & Constructors, Inc., Philadelphia, Pa.

Hydraulic Power, E. B. STROWGER, Buffalo Niagara & Eastern Power Corp., Buffalo, N. Y.

Insurance, J. H. NICKELL, Philadelphia Electric Co., Philadelphia, Pa.

Membership, EDWARD REYNOLDS, Columbia Gas & Electric Corp., New York, N. Y.

Prime Movers, J. A. KEETH, Kansas City Power & Light Co., Kansas City, Mo.

Prize Awards, H. P. LIVERSIDGE, Philadelphia Electric Co., Philadelphia, Pa.

Rate Research, F. A. NEWTON, The Commonwealth & Southern Corp., New York, N. Y.

General Commercial, R. E. FISHER, Pacific Gas & Electric Co., San Francisco, Cal.

Statistical, W. G. BOURNE, JR., The Commonwealth & Southern Corp., New York, N. Y.

Transmission and Distribution, E. V. SAYLES, The Commonwealth & Southern Corp., Jackson, Mich

Codes and Standards (a Subcommittee of the Operating Committee)
H. B. BRYANS, Philadelphia Electric Co., Philadelphia, Pa.

BOARD OF TRUSTEES
OF THE
EDISON ELECTRIC INSTITUTE

1941-1942

(Terms expiring 1942)

JAMES B. BLACK.....Pacific Gas and Electric Company, San Francisco, Cal.
JAMES F. FOGARTY.....The North American Company, New York, N. Y.
C. W. KELLOGG.....Edison Electric Institute, New York, N. Y.
B. W. LYNCH.....San Diego Gas & Electric Co., San Diego, Cal.
A. C. MARSHALL.....The Detroit Edison Company, Detroit, Mich.
THOMAS N. McCARTER.....Public Service Electric and Gas Company, Newark, N. J.
H. HOBART PORTER.....American Water Works & Electric Company, Inc., New York, N. Y.
HERBERT A. WAGNER.....Consolidated Gas Electric Light & Power Company of Baltimore, Baltimore, Md.
JUSTIN R. WHITING.....The Commonwealth & Southern Corporation, New York, N. Y.

(Terms expiring 1943)

PHILIP G. GOSSLER.....Columbia Gas & Electric Corporation, New York, N. Y.
H. P. LIVERSIDGE.....Philadelphia Electric Company, Philadelphia, Pa.
WILLIAM McCLELLAN.....Union Electric Company of Missouri, St. Louis, Mo.
K. M. ROBINSON.....The Washington Water Power Company, Seattle, Wash.
P. L. SMITH.....Middle West Corporation, Chicago, Ill.
GEORGE N. TIDD.....American Gas & Electric Company, New York, N. Y.
JOHN E. ZIMMERMANN.....The United Gas Improvement Company, Philadelphia, Pa.

(Terms expiring 1944)

D. C. BARNES.....Engineers Public Service Company, New York, N. Y.
SAMUEL FERGUSON.....The Hartford Electric Light Company, Hartford, Conn.
C. E. GROESBECK.....Electric Bond and Share Company, New York, N. Y.
W. J. HAGENAH.....Public Utility Engineering & Service Corp., Chicago, Ill.
EDWARD REYNOLDS.....Columbia Gas & Electric Corporation, New York, N. Y.
A. H. SCHOELLKOPF.....Niagara Hudson Power Corporation, New York, N. Y.
E. W. WAKELEE.....Public Service Corporation of New Jersey, Newark, N. J.